Final
Environmental Assessment

Designation of Critical Habitat for the Contiguous United States Distinct Population Segment of the Canada Lynx

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1. PURPOSE OF AND NEED FOR THE PROPOSED ACTION

1.1 Introduction

The U.S. Fish and Wildlife Service (Service) is proposing to designate critical habitat for the contiguous United States distinct population segment of the Canada lynx (*Lynx canadensis*) (hereafter referred to as lynx). This Environmental Assessment (EA) presents the purpose of and need for critical habitat designation, the proposed action and alternatives, and an evaluation of the direct, indirect, and cumulative effects of the alternatives pursuant to the requirements of the National Environmental Policy Act of 1969 (NEPA) as implemented by the Council on Environmental regulations (40 CFR 1500, et seq.) and according to the U.S. Department of the Interior (USDI) NEPA procedures.

1.1.1 Purpose of Action

The purpose of this proposed action is to designate critical habitat for lynx and to comply with section 4 of the ESA, which requires that critical habitat be designated for endangered and threatened species unless such designation is not prudent. A primary purpose of the ESA is to "provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved and endangered species depend" (section 2(b)). In certain instances, critical habitat designation is required by the ESA for listed species. Critical habitat designation will identify areas that contain the physical and biological features essential to the conservation of lynx and that may require special management or protection.

1.1.2 Need for Action

The need for this proposed action is to identify areas that contain the physical and biological features essential to the conservation of lynx and that may require special management considerations or protection (section 3(5)(A)). The designation of critical habitat also describes the physical and biological features essential to the conservation of lynx known as the Primary Constituent Elements (PCEs).

The lynx was listed as threatened under the Endangered Species Act of 1973, as amended (ESA) on March 24, 2000. The U.S. District Court for the District of Columbia instructed the Service to propose critical habitat by November 1, 2005, and issue a final rule for critical habitat by November 1, 2006. The Service published the Proposed Designation of Critical Habitat for the Contiguous United States Distinct Population Segment of the Canada Lynx on November 9, 2005 (70 FR 68294). A clarification of the proposal and reopening of the public comment period was published on February 16, 2006 (71 FR 8258).

The Service published the final rule listing the contiguous United States distinct population segment of the Canada lynx as threatened on March 24, 2000 (65 FR 16052). The lynx is listed in portions of 14 States--Colorado, Idaho, Maine, Michigan, Minnesota, Montana, New Hampshire, New York, Oregon, Utah, Vermont, Washington, Wisconsin, and Wyoming.

The final listing rule for the lynx indicated that designation of critical habitat for the lynx was prudent. On January 15, 2004, the U.S. District Court for the District of Columbia ordered the Service to propose critical habitat by November 1, 2005, and issue a final critical habitat rule by November 1, 2006.

Critical habitat is one of several provisions of the ESA that aid in protecting the habitat of listed species until populations have recovered and threats have been addressed so that the species can be removed from the list of threatened and endangered species. Critical habitat designation is intended to assist in achieving long-term protection and recovery of lynx and the ecosystems upon which they depend. Section 7(a)(2) of the ESA requires consultation for Federal actions that may affect critical habitat to avoid destruction or adverse modification of this habitat. Further explanation of critical habitat and its implementation is provided below. Under section 4(b)(2) of the ESA, the Secretary shall designate critical habitat on the basis of the best scientific data available and after taking into consideration the economic impact, and any other relevant impact, of specifying any particular area as critical habitat. The Secretary may exclude any area from critical habitat if he determines that the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat, unless he determines, based on the best scientific and commercial data available, that the failure to designate such area as critical habitat will result in the extinction of the species.

1.1.3 Decision to be Made by Responsible Official

This EA will be used by the Service to decide whether or not critical habitat will be designated as proposed, if the Preferred Alternative requires refinement, or if further analyses are needed through preparation of an Environmental Impact Statement. If the Preferred Alternative is selected as described, or with minimal changes, and no further environmental analyses are needed, then a Finding of No Significant Impact (FONSI) would be prepared.

1.2 Background

1.2.1 Canada Lynx

Canada lynx are medium-sized cats, generally measuring 75-90 centimeters (30-35 inches) long and weighing 8-10.5 kilograms (18-23 pounds) (Quinn and Parker 1987). They have large, well-furred feet and long legs for traversing snow; tufts on the ears; and short, black-tipped tails.

Lynx are highly specialized predators of snowshoe hare (*Lepus americanus*) (McCord and Cardoza 1982; Quinn and Parker 1987; Aubry et al. 2000). Lynx and snowshoe hares are strongly associated with what is broadly described as boreal forest (Bittner and Rongstad 1982; McCord and Cardoza 1982; Quinn and Parker 1987; Agee 2000; Aubry et al. 2000; Hodges 2000a, b; McKelvey et al. 2000b). The predominant vegetation of boreal forest is conifer trees, primarily species of spruce (*Picea* spp.) and fir (*Abies* spp.) (Elliot-Fisk 1988). In the contiguous United States, the boreal forest types transition to deciduous temperate forest in the Northeast and Great Lakes and subalpine forest in the west (Agee 2000). Lynx habitat can generally be described as moist boreal forests that have cold, snowy winters and a snowshoe hare prey base (Quinn and Parker 1987; Agee 2000; Aubry et al. 2000; Buskirk et al. 2000b; Ruggiero et al. 2000).

Snow conditions also determine the distribution of lynx (Ruggiero et al. 2000). Lynx are morphologically and physiologically adapted for hunting snowshoe hares and surviving in areas that have cold winters with deep, fluffy snow for extended periods. These adaptations provide lynx a competitive advantage over potential competitors, such as bobcats (*Lynx rufus*) or coyotes (*Canis latrans*) (McCord and Cardoza 1982; Buskirk et al. 2000a; Ruediger et al. 2000; Ruggiero et al. 2000). Bobcats and coyotes have a higher foot load (more weight per surface area of foot), which causes them to sink into the snow more than lynx. Therefore, bobcats and coyotes cannot efficiently hunt in fluffy or deep snow and are at a competitive disadvantage to lynx. Long-term snow conditions presumably limit the winter distribution of potential lynx competitors such as bobcats (McCord and Cardoza 1982) or coyotes.

Because of the patchiness and temporal nature of high quality snowshoe hare habitat, lynx populations require large boreal forest landscapes to ensure that sufficient high quality snowshoe hare habitat is available at any point in time and to ensure that lynx may move freely among patches of suitable habitat and among subpopulations of lynx. Populations that are composed of a number of discrete subpopulations, connected by dispersal, are called metapopulations (McKelvey et al. 2000c). Individual lynx maintain large home ranges (reported as generally ranging between 31-216 km^2 [12-83 mi^2]) (Koehler 1990; Aubry et al. 2000; Squires and Laurion 2000; Squires et al. 2004; Vashon et al. 2005). The size of lynx home ranges varies depending on abundance of prey, the animal's gender and age, season, and the density of lynx populations (Koehler 1990; Poole 1994; Slough and Mowat 1996; Aubry et al. 2000; Mowat et al. 2000; Vashon et al. 2005). When densities of snowshoe hares decline, for example, lynx enlarge their home ranges to obtain sufficient amounts of food to survive and reproduce.

In the contiguous United States, the boreal forest landscape is naturally patchy and transitional because it is the southern edge of the boreal forest range. This generally limits snowshoe hare populations in the contiguous United States from achieving densities similar to those of the expansive northern boreal forest in Canada (Wolff 1980; Buehler and Keith 1982; Koehler 1990; Koehler and Aubry 1994). Additionally, the presence of more snowshoe hare predators and competitors at southern latitudes may inhibit the potential for high-density hare populations (Wolff 1980). As a result, lynx generally occur at relatively low densities in the contiguous United States compared to the high lynx densities that occur in the northern boreal forest of Canada (Aubry et al. 2000) or the densities of a species such as the bobcat, which is a habitat and prey generalist.

Lynx are highly mobile; long-distance movements (greater than 100 km (60 mi)) are characteristic (Aubry et al. 2000; Mowat et al. 2000). Lynx disperse primarily when snowshoe hare populations decline (Ward and Krebs 1985; O'Donoghue et al. 1997; Poole 1997). Subadult lynx also disperse even when prey is abundant (Poole 1997), presumably to establish new home ranges. Lynx also make exploratory movements outside their home ranges (Aubry et al. 2000; Squires et al. 2001).

The boreal forest landscape is naturally dynamic. Forest stands within the landscape change as they undergo succession after natural or human-caused disturbances such as fire, insect epidemics, wind, ice, disease, and forest management (Elliot-Fisk 1988; Agee 2000). As a

result, lynx habitat within the boreal forest landscape is typically patchy because the boreal forest contains stands of differing ages and conditions, only some of which are suitable as lynx foraging or denning habitat at any point in time (McKelvey et al. 2000a; Hoving et al. 2004).

Snowshoe hares comprise a majority of the lynx diet (Nellis et al. 1972; Brand et al. 1976; Koehler 1990; Apps 2000; Aubry et al. 2000; Mowat et al. 2000; von Kienast 2003; Squires et al. 2004). When snowshoe hare populations are low, female lynx produce few or no kittens that survive to independence (Nellis et al. 1972; Brand et al. 1976; Brand and Keith 1979; Poole 1994; Slough and Mowat 1996; O'Donoghue et al. 1997, Aubry et al. 2000; Mowat et al. 2000). Lynx prey opportunistically on other small mammals and birds, particularly during lows in the snowshoe hare population, but alternate prey species may not sufficiently compensate for low availability of snowshoe hares, resulting in reduced lynx populations (Brand et al. 1976; Brand and Keith 1979; Koehler 1990; Mowat et al. 2000).

In northern Canada, lynx populations fluctuate in response to the cycling of snowshoe hare populations (Hodges 2000a; Mowat et al. 2000). Although snowshoe hare populations in the northern portion of their range show strong, regular population cycles, these fluctuations are generally much less pronounced in the southern portion of the range in the contiguous United States (Hodges 2000b). In the contiguous United States, the degree to which regional local lynx population fluctuations are influenced by local snowshoe hare population dynamics is unclear. However, it is anticipated that because of natural fluctuations in snowshoe hare populations, there will be periods when lynx densities are extremely low.

Because lynx population dynamics, survival, and recruitment are closely tied to snowshoe hare availability, snowshoe hare habitat is a component of lynx habitat. Lynx generally concentrate their foraging and hunting activities in areas where snowshoe hare populations are high (Koehler et al. 1979; Ward and Krebs 1985; Murray et al. 1994; O'Donoghue et al. 1997, 1998). Snowshoe hares are most abundant in forests with dense understories that provide forage, cover to escape from predators, and protection during extreme weather (Wolfe et al. 1982; Litvaitis et al. 1985; Hodges 2000a, b). Generally, hare densities are higher in regenerating, earlier successional forest stages because they have greater understory structure than mature forests (Buehler and Keith 1982; Wolfe et al. 1982; Koehler 1990; Hodges 2000b; Homyack 2003; Griffin 2004). However, snowshoe hares can be abundant in mature forests with dense understories (Griffin 2004).

Within the boreal forest, lynx den sites are located where coarse woody debris, such as downed logs and windfalls, provides security and thermal cover for lynx kittens (McCord and Cardoza 1982; Koehler 1990; Slough 1999; Squires and Laurion 2000; J. Organ, Service, in litt. 2001). The amount of structure (e.g., downed, large woody debris) appears to be more important than the age of the forest stand for lynx denning habitat (Mowat et al. 2000).

Additional information on the biology and status of the lynx can be found in the final listing rule published in the *Federal Register* on March 24, 2000 (65 FR 16052) and the clarification of findings published in the *Federal Register* on July 3, 2003 (68 FR 40076).

1.2.2 Previous Federal Actions

On July 8, 1998, the Service published a proposed rule to list the lynx as threatened (63 FR 36994). The Service published a final rule listing the lynx as threatened on March 24, 2000, and found that the designation of critical habitat for the lynx was prudent (65 FR 16052). As a result of an order from the U.S. District Court for the District of Columbia (Court) the Service again determined the lynx was threatened in a clarification of findings published on July 3, 2003 (68 FR 40076). The Court ordered the Service to propose critical habitat by November 1, 2005, and issue a final critical habitat rule by November 1, 2006.

The proposed rule for designation of lynx critical habitat was published November 9, 2005, in the *Federal Register* (70 FR 68294) with a 90-day comment period. A clarification of the proposal was published February 16, 2006 (71 FR 8258), reopening the comment period for an additional 74 days**.** The Service published Notice of Availability and provided written notice to interested individuals including Native American Tribes, private landowners, county commissioners, congressional and State representatives, State and Federal agencies, and other potentially interested parties, of the draft environmental assessment and draft economic analysis on September 11, 2006 (71 FR 53355) and provided 30 days for public review and comment. The draft Environmental Assessment and draft economic analysis were posted on the Service's website: http://mountain-prairie.fws.gov/species/mammals/lynx/.

1.2.3 Critical Habitat

Section 4(a)(3) of the ESA states that critical habitat shall be designated to the maximum extent prudent and determinable and that such designation may be revised periodically, as appropriate. Section 4(b)(2) of the ESA requires that critical habitat designation be based on the best scientific information available and that economic and other impacts must be considered. Areas may be excluded from critical habitat designation if it is determined that the benefits of excluding them outweigh the benefits of their inclusion, unless failure to designate such areas will result in the extinction of the species.

Critical habitat is defined in section 3(5)(A) of the ESA as: (i) the specific areas within the geographical area occupied by a species, at the time it is listed in accordance with the ESA, on which are found those physical or biological features (I) essential to the conservation of the species and (II) that may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species.

Section 3(5)(C) also states that critical habitat "shall not include the entire geographical area which can be occupied by the threatened or endangered species" except when the Secretary of DOI determines that the areas are essential for the conservation of the species.

The term "conservation" as defined in section 3(3) of the ESA means "to use and the use of all methods and procedures which are necessary to bring an endangered species or threatened species to the point at which the measures provided pursuant to this Act are no longer necessary."

Within the geographic area occupied by the species, the Service will designate only areas currently known to support the physical and biological features essential to the conservation of the species. If information available at the time of designation does not show an area provides features essential for the conservation of the species or that the area may require special management considerations or protection, then the area should not be included in the critical habitat designation.

Habitat is often dynamic, and species may move from one area to another over time. Furthermore, we recognize designation of critical habitat may not include all habitat eventually determined as necessary to recover the species. For these reasons, areas outside the critical habitat designation will continue to be subject to conservation actions that may be implemented under section 7(a)(1) and the regulatory protections afforded by section 7(a)(2) jeopardy standard and the section 9 take prohibition, as determined on the basis of the best available information at the time of the action. We specifically anticipate that federally funded or assisted projects affecting listed species outside their designated critical habitat areas may still result in jeopardy findings in some cases. Similarly, critical habitat designations made on the basis of the best available information at the time of designation will not control the direction and substance of future recovery plans, habitat conservation plans, or other species conservation planning efforts if new information available to planning efforts calls for a different outcome. Critical habitat contributes to the recovery strategy but does not by itself achieve recovery plan goals.

1.2.4 Consequences of Designation - the Section 7 Consultation Process

Section 7(a)(2) of the ESA requires every Federal agency, in consultation with and with the assistance of the Secretary, to ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. In fulfilling these requirements, each agency is to use the best scientific and commercial data available. This section of the ESA sets out the consultation process, which is further implemented by regulation (50 CFR Part 402).

Each Federal agency is to review its actions at the earliest possible time to determine whether any action may affect listed species or critical habitat. If the action may affect a listed species or critical habitat, consultation with the Service is needed (Figure 1). Informal consultation is an optional process that includes all discussions and correspondence between the Service and a Federal agency or designated non-Federal representative, designed to assist the Federal agency in determining whether formal consultation or a conference is required. If during consultation it is determined by the Federal agency, with the written concurrence of the Service, that the action is not likely to adversely affect listed species or critical habitat, the consultation process is terminated, and no further action is necessary.

During informal consultation, the Service may suggest modifications to the action that the Federal agency and any applicant could implement to avoid the likelihood of adverse effects to listed species or critical habitat. If the proposed action is likely to adversely affect a listed species or designated critical habitat, formal consultation with the Service is required. Formal consultation is a process between the Service and a Federal agency or applicant that--
(1) determines whether a proposed Federal action is likely to jeopardize the continued existence

of listed species or destroy or adversely modify designated critical habitat; (2) begins with a Federal agency's request and submittal of a complete initiation package; and (3) concludes with the issuance of a biological opinion and incidental take statement by the Service.

With the request to initiate formal consultation, the Federal agency is to include--(1) a description of the proposed action, (2) a description of the area that may be affected, (3) a description of any listed species or critical habitat that may be affected, (4) a description of the manner in which the listed species or critical habitat may be affected and an analysis of cumulative effects, (5) relevant reports including any environmental impact statement, environmental assessment, or biological assessment, and (6) any other relevant and available information.

Unless an extension is provided, formal consultation concludes 90 days after its initiation. Within 45 days after concluding formal consultation, the Service is to deliver a biological opinion to the Federal agency and any applicant. The biological opinion will include the Service's opinion on whether the action is likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of critical habitat. If the action is likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of critical habitat, the biological opinion will include a reasonable and prudent alternative, if any exist. A reasonable and prudent alternative is a recommended alternative action that can be implemented consistent with the scope of the Federal agency's legal authority and jurisdiction, that is economically and technologically feasible, and that would avoid the likelihood of jeopardizing the continued existence of the listed species or the destruction or adverse modification of designated critical habitat.

Additionally, in those cases where the Service concludes that an action (or the implementation of any reasonable and prudent alternatives) and the resultant incidental take of listed species will not violate section 7(a)(2), the Service will provide with the biological opinion a statement concerning incidental take that--(1) specifies the impact of the take on the species, (2) specifies the reasonable and prudent measures to minimize the impact, (3) sets forth terms and conditions that must be complied with by the Federal agency or any applicant to implement the reasonable and prudent measures, and (4) specifies procedures to handle any individuals actually taken. Reasonable and prudent measures, along with the terms and conditions that implement them, cannot alter the basic design, location, scope, duration, or timing of the actions and may involve only minor changes. Any taking covered in the incidental take statement and in compliance with the terms and conditions of the statement is not prohibited taking under the ESA and no other authorization or permit under the ESA is required.

1.2.5 Proposed Primary Constituent Element

In accordance with sections 3(5)(A) and 4(b)(2) of the ESA and regulations at 50 CFR 424.12, in determining which areas to propose as critical habitat, the Service is required to base critical habitat determinations on the best scientific data available to identify the physical and biological features that are essential to the conservation of the species and that may require special management considerations or protection. These features include, but are not limited to--(1) space for individual and population growth, and for normal behavior; (2) food, water, air,

light, minerals, or other nutritional or physiological requirements; (3) cover or shelter; (4) sites for breeding, reproduction, rearing (or development) of offspring; and (5) habitats protected from disturbance or that are representative of the historic geographical and ecological distributions of a species.

Generally, lynx habitat is broadly described as the boreal forest landscape. In the contiguous United States, the boreal forest is more transitional rather than true boreal forest of northern Canada and Alaska (Agee 2000). This difference is because the boreal forest is at its southern limits in the contiguous United States, where it transitions to deciduous temperate forest in the Northeast and Great Lakes and subalpine forest in the west (Agee 2000). The Service uses the term "boreal forest" because it generally encompasses most of the vegetative descriptions of the transitional forest types that comprise lynx habitat in the contiguous United States (Agee 2000).

The specific biological and physical features, otherwise known as the PCE, essential to the conservation of the lynx are:

> Boreal forest landscapes supporting a mosaic of differing successional forest stages and containing:
>
> **a)** Presence of snowshoe hares and their preferred habitat conditions, which include dense understories of young trees or shrubs tall enough to protrude above the snow; and
>
> **b)** Winter snow conditions that are generally deep and fluffy for extended periods of time; and
>
> **c)** Sites for denning having abundant coarse woody debris, such as downed trees and root wads.

1.2.6 Criteria for Defining Essential Habitat

The criteria for defining essential habitat are described in the proposal to designate critical habitat for the lynx (November 9, 2005; 70 FR 68294).

2. DESCRIPTION OF ALTERNATIVES

This section describes the proposal for critical habitat for the lynx. Alternatives are different ways of meeting the purposed and need for critical habitat designation as described in Chapter One, which can be summarized as to provide protection of habitat that is essential to the conservation of listed species.

Alternative A -- No Action Alternative

Alternative A, the No Action Alternative is defined as no designation of critical habitat for the lynx. An analysis of a No Action Alternative is required by NEPA, and it provides a baseline for analyzing effects of Action Alternatives.

Alternative B

Alternative B would designate critical habitat in portions of northern Maine (Unit 1) (Figure 2), northeastern Minnesota (Unit 2) (Figure 3), the Northern Rocky Mountains, (northwestern Montana and northeastern Idaho) (Unit 3) (Figure 4), and north-central Washington (Unit 4) (Figure 5) as described in the November 9, 2005, proposed rule (70 FR 68294) and as clarified on February 16, 2006 (71 FR 8258). The approximate size of the proposed CHUs under Alternative B is shown in Table 1. Table 2 shows the land ownership of the areas proposed for critical habitat designation under Alternative B.

TABLE 1. Alternative B:
Approximate Area of Four Critical Habitat Units Proposed for Canada Lynx

CRITICAL HABITAT UNIT	Miles^2	Kilometers^2
1. Maine	10,633	27,539
2. Minnesota	3,546	9,183
3. Rocky Mountains (Idaho/Montana)	3,549	9,192
4. North Cascades (Washington)	303	785
Total	**18,031**	**46,699**

TABLE 2. Alternative B:
Area (mi^2) that Would be Designated as Canada Lynx Critical Habitat by Land Ownership and State

STATE	FEDERAL	STATE	PRIVATE	TRIBAL	OTHER
Idaho	0.02	1	0	0	0
Maine	13	758	9,741	86	35
Minnesota	440	1,355	1,661	74	15
Montana	1,428	365	1,691	0	113
Washington	135	164	2	0	2
Total[1]	**2,016**	**2,643**	**13,095**	**160**	**165**
% of Total Proposed for Designation	**11.1**	**14.6**	**72.4**	**0.8**	**0.9**

[1] Due to differences in rounding precision, the total miles^2 presented in Table 1 are slightly less than the total in Table 2.

Each of these Units in Alternative B is considered to have been occupied by lynx at the time of listing or since. Each Unit contains the physical and biological features (PCE) that are essential to the conservation of lynx - boreal forest landscapes supporting a mosaic of differing successional forest stages and containing--(a) presence of snowshoe hares and their preferred habitat conditions, which include dense understories of young trees or shrubs tall enough to protrude above the snow; (b) winter snow conditions that are generally deep and fluffy for extended periods of time; and (c) sites for denning that have abundant coarse woody debris, such as downed trees and root wads. As a result, each Unit contains habitat to provide space for individual and population growth and for normal behavior; food; cover or shelter; sites for

denning and rearing of offspring; and conditions that complement the physiological adaptations of lynx for hunting in snow. The Units proposed for designation in Alternative B provide boreal forest habitat for breeding, non-breeding, and dispersing lynx in metapopulations across the species' range in the contiguous United States.

Lands not Included in Alternative B

Under Alternative B, lands that have incorporated measures from the Lynx Conservation Assessment and Strategy (LCAS) (Ruediger et al. 2000) into their management, or are operating under a Conservation Agreement with the Service to reduce or eliminate adverse effects or risk to lynx and its occupied habitat pending amendments to management plans, are not included. Management of these lands have been amended or revised to incorporate substantial and relevant conservation measures of the LCAS, or the equivalent thereof. These management plans were determined by the Service to preclude additional need for "special management considerations or protection," specified as a criterion in the definition of critical habitat (ESA section 3(5)(A)).

The lands not included in Alternative B consist of: (1) lands (including non-Federal inholdings) within Lynx Analysis Units (as defined in the LCAS) in the Superior National Forest in Minnesota as a consequence of the Superior National Forest having revised its Land and Resource Management Plan to incorporate measures to conserve lynx based on the LCAS; (2) the Bureau of Land Management's (BLM) Garnet Resource Area in Montana because its plan has been amended to incorporate all provisions of the LCAS; (3) the Flathead Indian Reservation in Montana because their Forest Management Plan incorporates the provisions of the LCAS; (4) the Spokane District of BLM in Washington because their plan has been modified to incorporate the provisions of the LCAS; and (5) National Forest lands in Idaho, Montana, and Washington (see Table 3) because these National Forests operate under a Conservation Agreement requiring the USFS to use the LCAS in determining the effects of actions on lynx until Forest Plans are amended or revised to adequately conserve lynx (USFS and Service 2000; USFS and Service 2005). All of the Plans for these National Forests are in the process of being amended or revised to provide conservation measures for lynx.

TABLE 3. National Forests With Incorporated Provisions of Lynx Conservation Assessment and Strategy or Covered by a Lynx Conservation Agreement

CRITICAL HABITAT UNIT	NATIONAL FOREST
North Cascades	Okanogan-Wenatchee
Northern Rocky Mountains	Flathead Helena Idaho Panhandle Kootenai Lewis and Clark Lolo
Minnesota	None
Maine	None

Alternative C -- Preferred Alternative

Alternative C, the preferred alternative, is a subset of Alternative B. Alternative C would designate critical habitat within three National Parks located in the four aforementioned critical habitat units (Figure 6). The areas designated as critical habitat would include--Voyageurs National Park in the northeastern Minnesota Unit (Unit 2) (Figure 7); lands of Glacier National Park above 1,219 meters (4,000 feet) elevation on the west side of the Continental Divide and to the Park borders on the east of the Continental Divide in the Northern Rocky Mountain Unit (Unit 3) (Figure 8); and lands of North Cascades National Park above 4,000 feet elevation east of the Cascade Crest in the North Cascade Unit (Unit 4) (Figure 9). No lands in Maine or Idaho are designated as critical habitat under Alternative C. Lands with management plans that have incorporated the LCAS or for which a Conservation Agreement exist (i.e., those that are not included in Alternative B) also are not included in Alternative C.

Each of the areas proposed for designation under Alternative C is considered to have been occupied by lynx at the time of listing or since and contain the physical and biological features (PCEs) that are essential to the conservation of lynx: boreal forest landscapes supporting a mosaic of differing successional forest stages and containing--(a) presence of snowshoe hares and their preferred habitat conditions, which include dense understories of young trees or shrubs tall enough to protrude above the snow; (b) winter snow conditions that are generally deep and fluffy for extended periods of time; and (c) sites for denning that have abundant coarse woody debris, such as downed trees and root wads. As a result, each Unit contains habitat to provide space for individual and population growth and for normal behavior; food; cover or shelter; sites for denning rearing of offspring; and conditions that complement the physiological adaptations of lynx for hunting in snow. The Units proposed for designation in Alternative C provide boreal forest habitat for breeding, non-breeding, and dispersing lynx in.

Lands Excluded

Section 4(b)(2) of the Act states that critical habitat shall be designated, and revised, on the basis of the best available scientific data after taking into consideration the economic impact, national security impact, and any other relevant impact, of specifying any particular area as critical habitat. The Secretary may exclude an area from critical habitat if he determines that the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat, unless he determines, based on the best scientific data available, that the failure to designate such areas as critical habitat will result in the extinction of the species.

Under Alternative C, certain lands were excluded from the final critical habitat designation after consideration of economic impact or other relevant impacts determined that the benefits of exclusion outweigh the benefits of specifying such areas as part of the critical habitat. Excluded lands are as follows:

Maine – All lands containing PCEs and determined to be essential to the conservation of the Canada lynx have been excluded from this unit.

Minnesota – All lands, other than Voyageurs National Park, containing the PCEs and determined to be essential to the conservation of the Canada lynx have been excluded from this unit.

Northern Rocky Mountains – All lands, other than Glacier National Park, containing the PCEs and determined to be essential to the conservation of the Canada lynx have been excluded from this unit.

North Cascades – All lands, other than North Cascades National Park, containing the PCEs and determined to be essential to the conservation of the Canada lynx have been excluded from this unit.

The approximate sizes of the critical habitat areas and the area excluded under Alternative C are shown in Table 4. Table 5 shows the land ownership of the areas of critical habitat designation under Alternative C.

TABLE 4. Alternative C:
Approximate Size of Three Areas Designated as Canada Lynx Critical Habitat and Excluded Areas

	CRITICAL HABITAT AREA		EXCLUDED AREA	
STATE	**mi^2**	**(km^2)**	**mi^2**	**(km^2)**
1. Maine	0	0	10,633	(27,530)
2. Minnesota	317	(822)	3,229	(8,363)
3. Montana	1,389	(3,598)	2,159	(5,592)
4. Idaho	0	0	1	(3)
5. Washington	135	(348)	168	(435)
Total	**1,841**	**(4,768)**	**16,190**	**(41,923)**

TABLE 5. Alternative C:
Area of Critical Habitat Designated for Canada Lynx by Critical Habitat Unit and Land Ownership

CRITICAL HABITAT UNIT	FEDERAL LAND OWNERSHIP	mi^2	(km^2)
Maine	none designated	0	(0)
Minnesota	Voyageurs National Park	317	(822)
Northern Rockies	Glacier National Park	1,389	(3,598)
North Cascades	North Cascades National Park	135	(348)
	Total	**1,841**	**(4,768)**

2.1 Alternatives Considered but Not Fully Evaluated

2.1.1 Designation of All Areas Within Geographic Range of Lynx in Contiguous United States

The lynx was listed in the 14 States that supported both boreal forest habitat types and verified records of lynx. Designating critical habitat in every area considered within the geographic range of lynx was not carried forward as an alternative because the ESA specifies that except in those circumstances determined by the Secretary, critical habitat shell not include the entire geographic area which can be occupied by the species. Furthermore, many of the areas within the geographic range do not meet the criteria for critical habitat in that they do not have evidence of supporting breeding populations of lynx.

2.1.2 Designation of Recovery Areas as Described Within the Recovery Outline for Lynx

In 2005, the Service completed a recovery outline for the lynx. Recovery outlines are brief, internally-developed documents intended as preliminary strategies for conservation of listed species until a formal recovery plan is completed. The lynx recovery outline was prepared by Service staff experienced in lynx conservation and/or recovery planning under the ESA and two lynx experts from the U.S. Forest Service (USFS). The lynx recovery outline presents current understandings of historical and current lynx distribution, ecology, and population dynamics. The outline introduces concepts regarding the relative importance of different geographic areas to the persistence of lynx in the contiguous United States, identifying areas as either core, provisional core, secondary or peripheral based primarily on lynx records over time and evidence of reproduction. Additionally, the outline describes preliminary recovery objectives and actions. The Recovery outline was not analyzed as an alternative since it did not meet the criteria for critical habitat in the proposed rule (as described in the rule itself) and was not rigorously developed to satisfy the needs of this critical habitat designation. While the recovery outline provides important information that was used in the critical habitat designation process, it was not sufficient to be carried forward as an alternative.

2.2 Comparison of Alternatives

The following Table 6 summarizes the potential effects of the alternative critical habitat designations. Potential effects on resources are summarized from the analyses presented in Chapter 4.

TABLE 6.
Comparison of Potential Effects of Lynx Critical Habitat Designation Alternatives by Resource Category

RESOURCE CATEGORY	ALTERNATIVE A No Action Alternative	ALTERNATIVE B	ALTERNATIVE C Preferred Alternative
Total miles[2]	0	18,031	1,841
Number of CHUs	0	4	3

3. DESCRIPTION OF THE AFFECTED ENVIRONMENT

The areas considered for designation as lynx critical habitat are rural, forested lands. Uses and activities are primarily related to forest management, wildland fire management, and recreation. Private, county, State, Tribal, and Federal lands are included in the proposed action.

The designation of critical habitat directly affects only Federal agencies. The ESA requires Federal agencies to ensure that actions they fund, authorize, or carry out do not destroy or adversely modify critical habitat to the extent that the action appreciably diminishes the value of the critical habitat for the survival and recovery of the species. Individuals, organizations, States, local and Tribal governments, and other non-Federal entities are only affected by the designation of critical habitat if their actions occur on Federal lands, require a Federal permit, license, or other authorization, or involve Federal funding (for example, section 404 Clean Water Act permits from the U.S. Army Corps of Engineers or funding of activities by the Natural Resource Conservation Service).

For purposes of this discussion, the affected environment refers to the general area described as the range of the lynx in the November 9, 2005, proposed rule (Service 2005a) and as clarified on February 16, 2006 (Service 2006). In the Draft Economic Analysis (Industrial Economics, Inc. 2006) this affected environment was referred to as the study area. For Alternative C, the discussion of the affected environment provides additional detailed information on the areas previously described within the three National Parks.

3.1 Physical Environment

The areas considered for designation as lynx critical habitat are generally described as boreal or cold temperate forest having cold winters with deep snow and providing a snowshoe hare prey base (Quinn and Parker 1987, McKelvey et al. 2000b, Mowat et al. 2000) (see Chapter 1.1.1, above). The predominant vegetation of this forest is conifer trees, primarily species of spruce (*Picea* spp.) and fir (*Abies* spp.) (Elliot-Fisk 1988). In the contiguous United States, the boreal forest types transition to deciduous temperate forest in the Northeast and Great Lakes and subalpine forest in the west (Agee 2000).

Counties within the proposed action area, Alternative B, are:

1) Idaho (Unit 3) - Boundary

2) Maine (Unit 1) - Aroostook, Franklin, Penobscot, Piscataquis and Somerset

3) Minnesota (Unit 2) - Cook, Koochiching, Lake, and St. Louis

4) Montana (Unit 3) - Flathead, Glacier, Granite, Lake, Lewis and Clark, Lincoln, Missoula, Pondera, Powell and Teton

5) Washington (Unit 4) - Chelan and Okanogan

Minnesota Unit - Voyageurs National Park

Voyageurs National Park landscape is the product of glaciations which shaped the topography of the Park into a low plateau of rolling hills and a labyrinth of lakes and waterways. Relief is modest – land elevations are rarely more than 30 meters (100 feet) above the major lake elevations, while the eastern and southern sections can be 200 to 300 feet (60 to 90 meters) above the lake levels. Lakes, swamps, and bogs comprise fully 50% of the Park's area. Voyageurs National Park drains toward the north into the Winnipeg River, and ultimately Hudson Bay. Almost 60% of Voyageurs National Park has been proposed as Wilderness, and is managed by the National Park Service so as not to impair its wilderness qualities and in expectation of its eventual designation as Wilderness.

The regional climate of the Park is quite severe, noted for its extreme temperature fluctuations on a daily as well as an annual basis. Cold, usually dry, continental polar air masses flow southward from Canada and collide with maritime air masses to generate pronounced variations in weather. Winter temperatures frequently fall well below 0ºF. The average annual precipitation for nearby International Falls is 24 inches, divided between rain and snow.

Northern Rocky Mountains Unit - Glacier National Park

Glacier NP is located in northwestern Montana in the Rocky Mountain Province. The mountain and valley landforms originated from block fault uplifting and glaciation from the last ice age. The wide variations in climate, elevation, geology, and soils within the Park help define geographic vegetation patterns. Ninety-five percent of Glacier National Park is proposed wilderness, and following National Park Service policy, is managed as designated wilderness.

Northern Cascade Unit - North Cascade National Park

The Northern Cascades are part of a mountain range that stretches from Canada to California along the Pacific Crest. Glaciers have carved the mountain landscape into jagged peaks, deep valleys and long lakes. The North Cascade National Park Complex is the most heavily glaciated area in the United States outside of Alaska, containing more than 300 glaciers. Thousands of miles of rivers and streams flow from glaciers and lakes, tarns, and ponds. Steep mountains rise to over 9,000 feet from valley floors.

The climate is dominated by the rugged topography of the North Cascades Range, the proximity of the area to the Pacific Ocean, and latitude. Strong seasonal, interannual, and interdecadal fluctuations in winter precipitation also are important climatic features. Most precipitation falls during the fall and winter. Winter precipitation varies strongly from year to year, depending on seas surface temperatures and weather pressure systems in both the tropical and north central Pacific Ocean.

3.2 Fish, Wildlife and Plants

3.2.1 Threatened and Endangered Wildlife

As lynx has already been discussed in previous sections, it will not be discussed in detail in this section. The following is a list and a summary of effects for all the threatened, endangered and proposed wildlife species which may be found in lynx habitat and lynx linkage areas. Plant species will be summarized in the plant section of this chapter.

Federally listed species that could occur in the affected environment--in addition to lynx (see Section 1.1.1)--are listed in Table 7. Additionally, many species of non-listed birds, mammals, fish, reptiles, and amphibians also use boreal forest habitat within the proposed action area of Alternative B.

The North Cascades Ecosystem in Washington, which includes North Cascades National Park, and the Northern Continental Divide Ecosystem, which includes Glacier National Park, are designated as two of six grizzly bear recovery zones in the contiguous states. A very small population of grizzly bears occupies the North Cascades National Park Complex and the adjacent Canadian Province of British Columbia. The Northern Continental Divide population is estimated at more than 400 bears.

Table 7 includes fish listed as threatened or endangered. Much of the lynx habitat is at relatively high elevation where streams are generally small and of low productivity and lake fisheries are often cold water, low productivity, and generally stocked to sustain recreational angling.

TABLE 7. Federally Listed Species That Could Occur in Affected Area

COMMON NAME	SCIENTIFIC NAME	OCCURRENCE IN NATIONAL PARKS*	ESA STATUS
MAMMALS			
Gray wolf	*Canis lupus*	V, G, NC	E/T/PD
Grizzly bear	*Ursus arctos horribilis*	G, NC	T
Woodland caribou	*Rangifer tarandus caribou*		E
BIRDS			
Bald eagle	*Haliaeetus leucocephalus*	V, G, NC	T
Northern spotted owl	*Strix occidentalis caurina*	NC	T
FISH			
Bull trout	*Salvelinus confluentus*	G, NC	T
Kootenai River white sturgeon	*Acipenser transmontanus*		E
Spring Chinook salmon	*Onchoryhnchus tshawytscha*	NC	E
Steelhead trout	*Onchoryhnchus mykiss*		T
PLANTS			
Furbish's lousewort	*Pedicularis furbishiae*		E
Eastern prairie fringed orchid	*Platanthera leucophaea*		T
Water howellia	*Howellia aquatilis*		T

* V = Voyageurs, G = Glacier, NC = Northern Cascades Complex
E = Endangered
T = Threatened
PD = Proposed for delisting in the Great Lakes area

3.2.2 Threatened and Endangered Plant Species

NORTHERN ROCKY MOUNTAINS

No threatened or endangered plant species occur in the action area outside of the Northern Rocky Mountains. There are 216 Threatened, Endangered, and Sensitive (TES) plant species that may occur in the Northern Rocky Mountains (USFS 2004a). They include 1 federally listed species, 1 candidate for listing, and 214 USFS sensitive (USFS 1999a, b) or BLM special status plant species (BLM 2001, 2002).

These plants occur infrequently and are generally found in specific habitats. Many are found in wet areas because they need more moisture to survive. Some are found in older stands of lodgepole pine, grand fir, or subalpine fir. A few are associated with young regenerating stands, and some require periodic disturbance to maintain their populations.

3.3 Forest Resources

MAINE

Maine's forest stands generally are diverse and more closely resemble "natural" forests than more intensively managed forests in other parts of the world. The composition of Maine's forests is heavily influenced by three factors--extensive areas of thin, rocky, and poorly drained soils, intermixed with scattered areas of deeper, better-drained soils; a cool climate and abundant precipitation; and recurrent insect outbreaks (Maine Land Use Regulation Commission 2006). A mixture of hardwoods and softwoods comprise the forest, changing in composition as one moves to higher elevations. North and east the principal softwoods found in Maine are spruce, fir, white pine, cedar, tamarack, and hemlock; the principal hardwoods are maple, birch, beech, oak, ash, and aspen.

MINNESOTA

The composition of Minnesota's forests in the proposed action area includes boreal, coniferous, and mixed coniferous/deciduous vegetation types dominated by pine, balsam fir, black and white spruce, northern white cedar, tamarack, aspen, paper birch, conifer bogs and shrub swamps (USFS 2004c). Northeastern Minnesota lies in a transition zone or ecotone between the "northern hardwoods" zone of cool temperate and mostly deciduous forests to the south, and the conifer-dominated boreal forests to the north. The ecosystem is classified as a subsection of the Northern Superior subplains section, Laurentian mixed forest province.

A third biome – the tallgrass prairie – is nearby. The forests in this region of northern Minnesota are sometimes referred to as the southern transitional boreal forest. All the major tree species characteristic of the central Canadian boreal forest—black and white spruce, jack pine, balsam fir, tamarack, trembling aspen, paper birch, and balsam poplar are common. Yet trees typical of the Great Lakes forests—red and white pine, basswood, red maple, northern pin oak, red oak,

large-toothed aspen, and black ash – also occur. Though transitional, the character of the area is primarily boreal, as evidenced by the complete absence of silver maple and eastern hemlock, important trees of the Great Lakes forest type.

Species composition in boreal forests is controlled primarily by fire, but in hardwood forests, wind is a more important factor. Where these forest types overlap, wildlife, wind, fire, and activities such as logging can result in the return of hardwoods where pines were cut, or boreal forest species where wildlife preferentially browse on young hardwood saplings.

Boreal forests are less productive than northern hardwoods, primarily a result of a limited supply of the key nutrient nitrogen, which spruce and fir retain in their needles. Microorganisms cannot easily decompose these needles, so nitrogen is sequestered in leaf litter for a much longer time in boreal forests than in northern hardwood forests. When fire burns these forests, it re-injects the nitrogen back into the soil. Hardwoods like aspens and birches may then have an advantage, as they are able to utilize nitrogen more quickly than boreal species. However, plant-eating wildlife (herbivores), such as moose, beaver, and snowshoe hare, complicate the relative abundance of tree species by feeding preferentially on young hardwoods. This preferential browsing can shift the composition of some areas of the forest toward boreal vegetation. Local climatic and specific moisture conditions also help determine whether a patch of boreal or hardwood forest will grow. Where the climate is warm enough to support northern hardwoods, boreal stands occupy only wet or cool micro-sites; where the climate is cooler, boreal forest.

VOYAGEURS NATIONAL PARK

Vegetation of the Park is dynamic. The plant communities observed today are the product of both long-term natural and more recent human influences, and continue to undergo succession.

The major vegetation communities in Voyageurs National Park are described below:

Spruce-Fir-Aspen Forest

This vegetation community is common in Voyageurs, comprising approximately 14% of the Park's land area. Dominant trees in the canopy of this community are aspen, paper birch, white spruce and balsam fir. Dominant plants in the shrub layer are balsam fir, red maple and beaked hazel; dominant plants in the herbaceous layer are bracken fern, large-leaf aster, sarsaparilla, and bunchberry. This community tends to occur on gentle slopes with variable aspects, on soils that are usually rocky, shallow sandy loam or silt loam.

In the absence of disturbance, some pine stands may succeed to this community. Common agents of disturbance for the spruce-fir-aspen community include wind, drought, disease and insects. Within the Park, many of the balsam firs in this community are dying of spruce-budworm infestations. Also, beavers often selectively browse aspen and birch in stands of this community that are adjacent to beaver ponds, which can shift the composition from spruce-fir-aspen dominance to spruce-fir-mountain maple.

Red and White Pine Forests

Four community types are included under this broad heading:

1. Red Pine-Aspen-Birch: Dominant canopy trees are red pine, jack pine, white pine, balsam fir, paper birch, and aspen. The shrub layer is characterized by balsam fir, mountain maple, serviceberry, beaked hazel, bush-honeysuckle, twinflower, fly honeysuckle, and blueberry.

2. White Pine-Aspen-Birch: Dominant canopy trees are white pine, paper birch, aspen, white spruce and balsam fir. Balsam fir, mountain maple, serviceberry, beaked hazel, bush-honeysuckle, twinflower, fly honeysuckle, and velvet leaf blueberry characterize the shrub layer. These stands may be a successional stage after fire or logging.

3. Red Pine / Blueberry Dry Forest: This community per se is quite rare in the Park, though it is usually found as part of the white pine-red pine-aspen-birch mosaic community, which is common in the Park. Its canopy consists of red or red and white pine. The shrub layer consists predominantly of balsam fir, beaked hazel, white pine, and serviceberry. Fire suppression may be allowing mesic hardwood forests to succeed red pine; with frequent fires, white pine may succeed red pine as it is more tolerant of frequent understory fire.

4. White Pine / Mountain Maple Mesic Forest: The canopy consists of white pine and red pine. Balsam fir, beaked hazel, and serviceberry characterize the shrub layer. This type occurs on well to moderately well- drained, dry mesic sites with gentle slopes and variable aspects throughout the Park. Fire is important in white pine stands because post-fire high sunlight conditions and exposed mineral soil are favorable to seedling establishment. Once established, white pines are tolerant of surface fires, which may increase the persistence of the stand by reducing shrub and herbaceous layers and exposing mineral soils favorable to seedlings. White pine is most abundant in forests with long intervals (150-350 years) between catastrophic fires.

Overall, these four forest community types comprise approximately 12% of the Park's land area. Red and white pines were heavily impacted by logging between 1909 and 1929 and fire suppression continues to degrade these stands. The area occupied by pine these forest communities has decreased substantially over the last century.

Northern Hardwood Shrub Swamps

This name refers to two community types – speckled alder swamp and dogwood-pussy willow swamp – which together occupy about 3% of the Park's land area. Speckled alder swamp is dominated by speckled alder, willow and swamp birch. It is found in a wide range of environmental conditions, but most commonly as rings around the edges of nutrient-poor peatlands or as isolated low areas surrounded by uplands.

Dogwood-pussy willow swamp is dominated by seven species of willow including pussy willow. It is found in beaver meadows and along the shorelines of sheltered bays of the large lakes in areas that are seasonally flooded. Shrub swamps are considered mid-successional communities between wet meadows or fens and conifer or hardwood swamps. Frequent fires in wetlands are

believed to keep woody vegetation, both shrubs and trees, from persisting. Fire suppression in recent years may have allowed the establishment of shrub swamps in areas that were formerly grassy wet meadows or fens.

Jack Pine / Balsam Fir Forest

This vegetation community is well-represented in Voyageurs, comprising approximately about 3% of the Park's land area. The dominant canopy species is jack pine, with a subcanopy consisting predominantly of balsam fir, paper birch and black spruce, and an herbaceous layer of large-leaf aster, sarsaparilla, and bracken fern.

This community occurs on flat or gently sloping, rocky upland sites with variable aspects and well-drained loam or sandy loam soils. It is similar to the jack pine rocky woodland, though with a denser canopy. Jack pine / balsam fir stands originate after fire and may be maintained by fire, in the absence of which, they may eventually succeed to fir-spruce-birch forest.

Aspen-Birch / Boreal Conifer Forest

This community is one of the most common and variable in the Park, comprising about approximately 20% of Voyageurs' land area. It is an early successional boreal forest community common after fire and/or logging, and its abundance in the Park today may be attributable to the area's logging history. It frequently occurs in close association with red and white pine forest and jack pine / balsam fir forest.

Dominant trees in the canopy are trembling aspen, bigtooth aspen, and paper birch. Balsam fir and red maple predominate in the subcanopy, while common herbaceous species include bracken fern, large-leaf aster, and sarsaparilla. This community type is found in a wide variety of environments, ranging from moderately-drained, lowland areas to well-drained ridges with shallow soils, usually on flat to slightly-sloping terrain with variable aspects. The current distribution of this community may be due to the pattern of logging and catastrophic fire on boreal sites with an insufficient pine seed source to regenerate pine forest. Aspens suckers (sprouts from the stem and roots) regenerate readily and rapidly when aspen trees are top-killed.

NORTHERN ROCKY MOUNTAINS

Wildfire plays a major role in determining forest structure, composition, and landscape patterns in the northern Rocky Mountains (USFS 2004a). Fire history data from the Interior Columbia Basin region shows extensive fire activity at least every decade or two between the mid-1500s and the early 1900s (Barrett et al. 1997). An estimated 12 million acres burned in the northern Rockies between 1908 and 1947 (Lotan et al. 1985).

Wildfire plays a major disturbance role in the higher elevations (Ruediger et al. 2000). Although lynx habitat typically has mixed severity to stand-replacing fire regimes, some fires are low intensity, which allow some tree species to survive fire.

Species such as western larch, lodgepole pine, ponderosa pine, quaking aspen, western white pine, and whitebark pine have adapted to fire as a major disturbance agent (Fischer and Bradley 1987; Smith and Fischer 1997). Due to fire suppression during the last 80 years, many of these species have declined (Quigley et al. 1996).

Logging has changed the landscape in some places. Extensive salvage logging took place after mountain pine beetles killed many trees during the 1960s through the 1980s in large areas in the southern and eastern parts of the northern Rocky Mountains. The cedar-hemlock zone in north Idaho and the larch-lodgepole forests of western Montana, also have a history of logging on the more accessible terrain. Timber harvest in these areas has contributed to the quantity of young regenerating forests, although fire has had a much greater impact.

Western White Pine

Western white pine (*Pinus monticola)* grows in the moist forests in northern Idaho and western Montana. This tree has been in major decline over the past 60 years. The proportion of western white pine declined from 44% in 1941 to 5% in 1979 (Graham 1990). Since the 1930s, more than 95% of western white pine cover types have converted to grand fir, Douglas fir, or western red cedar/western hemlock (USFS 1998). Only about 90,000 acres in north Idaho and western Montana still exist in the western white pine cover type.

Western white pine blister rust (*Cronartium ribicola*) spread to the Pacific Northwest from Europe by the 1920s (Graham et al. 1993) and killed many trees in northern Idaho. Naturally occurring rust-resistant wild trees were discovered in the 1940s; genetic resistance is carried in a low percentage of the population. It is the intent of selection to increase the frequency of resistant genes in western white pine planting stock (Byler et al. 1993). As such, rust-resistant trees are an important part of the genetic resource program.

Fire suppression and logging changed the distribution of western white pine. In presettlement times, low- and intermediate-intensity burns produced an irregular, patchy mosaic of vegetation. Fires frequently shortened how long the dense stem-exclusion stages lasted by thinning them and breaking holes in uniform canopies (Zack and Morgan 1994).

Western white pine is well adapted to mixed-severity fire regimes. In fact, it depends on the disturbance fire or timber harvest provides to remove competing conifers and allow it to become established (Graham 1990). Its relatively thin bark and moderately flammable foliage make it intermediate in fire resistance (Graham 1990). In the past, fire removed the competing conifers (Graham 1990).

Whitebark Pine

Whitebark pine (*Pinus albicaulis*) is a hardy subalpine conifer that tolerates poor soils, steep slopes, and windy exposures. It grows at higher elevations across much of the northern Rockies. Currently, whitebark pine is found mainly at the timberline. It is a component of many habitat types and is distributed across a variety of site conditions in the Northern Rockies area.

In lynx habitat, whitebark pine is found in productive places where it grows densely with western white pine, spruce, and fir. It also grows in sparse clusters on harsh, rocky places in the upper subalpine zone. Harsh whitebark pine sites do not support the stem densities capable of supporting hare populations and are not considered lynx habitat.

Whitebark pine is hardier than other conifers and can become established on dry, cold subalpine sites. It is a relatively slow growing tree and can be out-competed for growing space by conifers that are more shade tolerant. Where it competes with other species that need full sun, whitebark pine is often able to maintain its presence (Tomback et al. 2001).

Historically, whitebark pine accounted for ten to 15% of the forest cover in the northern Rocky Mountains (Arno and Weaver 1990); now it amounts to only about 5%. In the Northern Rockies area, about 1.5 million acres are in the whitebark pine cover type. Blister rust and fire suppression have substantially reduced its presence. Epidemics of mountain pine beetles have further reduced isolated populations.

Historically, mixed severity fires maintained whitebark pine at high elevations by removing competing species. Without fire, whitebark pine is eventually replaced by subalpine fir and spruce. The long-term consequence of keeping fire out is changing the fire regime from mixed severity to stand-replacing (Arno and Hoff 1990; Keanne et al. 2002).

Quaking Aspen

Quaking aspen *(Populus tremuloides)* is a species that needs full sun that commonly grows in even-aged forests. Aspen is distributed throughout the northern Rockies in small, isolated areas. It is more extensive east of the Continental Divide in Montana and in the southern half of the Northern Rockies area in Wyoming and Utah (Mueggler 1985).

Some single-storied aspen forests have two distinct generations, consisting of a more or less substantial scattering of old veterans that stand among younger, more slender trees. The older trees usually are the survivors of fire a decade or more earlier that killed much of the stand and gave rise to the younger trees. Many of the younger trees grow as tall as the older ones, and with them, form a closed canopy (Jones and DeByle 1985).

Conifers growing beneath aspen are generally younger than the aspen because aspen regenerates so quickly from existing roots (Sheppard and Jones 1985). Many aspen forests are threatened with invasion by shade-tolerant conifers. From 50 to 70% of the quaking aspen in USFS Region 1 has been lost because of fire suppression and grazing (USFS 1998). Grass, forbs, shrubs, or conifers may replace aspen in the absence of fire (Jones and DeByle 1985).

Fire has been the most important disturbance factor in aspen, changing structural stages and composition and minimizing competition by conifers. If fire takes place infrequently (every 50 years or so) and is intense enough to kill most or all of the aspen trees and the competing conifers, aspen is retained (Jones and DeByle 1985).

Mixed-severity fires where aspen grow at mid- and high elevations historically regenerated aspen and maintained the balance between aspen and conifers. Severe or repeated burns may reduce site quality, resulting in reduced growth rates.

Western Larch

Western larch *(Larix occidentalis)* is found in northern Idaho and western Montana. Larch grows in diverse habitats, ranging from moist Douglas fir and grand fir, western red cedar and western hemlock, to cooler subalpine fir sites. Larch is the conifer species that most needs full sun in the northern Rockies. It regenerates in full sunlight and large openings after major disturbance. To survive, larch must maintain a dominant position in the stand. If overtopped by other trees, larch growth will slow and the trees usually die (Fielder and Lloyd 1995). Larch is extremely well adapted to fire. Mature larch have bark that is often more than 6 inches thick, containing little resin, with branches far above the ground and foliage of low flammability.

Larch is able to tolerate crown scorch and defoliation, producing new foliage and rebranching on the trunk. At least some of the old larch usually survives even intense fires, at least long enough to produce a seed crop to regenerate receptive seedbeds. Even young larch wounded at the base of the stem in a surface fire, heal and continue to grow for centuries. On burned seedbeds, larch seedlings generally outgrow their competitors (Arno and Fischer 1995).

Historically, fire maintained larch forest. Stand-replacing fires burned moist larch sites at mean intervals of from 120 to 350 years. Low- to intermediate-intensity fires favored larch by thinning out much of the competition (Arno and Fischer 1995; Carlson et al. 1995).

After fire, a residual cover of 20% or fewer large trees was common historically (Quigley et al. 1996). This structure of large residual trees, occurring singly or in small groups, has declined in many areas. The big larch has been logged out in many places. In moist places lacking fire or thinning, trees that are more shade-tolerant can replace larch in 90-140 years. With fire or thinning, larch can maintain dominance for 200 years or more.

Western larch has declined in the northern Rockies because of fire suppression and logging (USFS 1998). Tree species composition has shifted to shade-tolerant Douglas fir, grand fir, and lodgepole pine. Because of the shift, current fire-return intervals are longer than 100 years and fire behavior is more extreme, rather than the combination of fires that favored larch (USFS 1998).

Ponderosa Pine

Ponderosa pine *(Pinus ponderosa)* is not significantly represented in lynx habitat in the northern Rockies. Generally, it grows in places too dry to support snowshoe hare and lynx; however, it is represented in lynx habitat in the warm, moist cedar forests of northern Idaho and western Montana.

Fire has played a major role in cedar forests with ponderosa pine. The diverse species and structures indicate pre-settlement fire patterns were highly variable. Shorter fire-return intervals likely favored ponderosa pine. Most cedar forests experienced mixed-severity fire. The ponderosa pines were able to survive some stand-replacing fires (Smith and Fischer 1997).

In most of lynx habitat, shade-tolerant trees out-compete ponderosa pine without some disturbance that reduces stem densities. Even if fire were returned to these ecosystems, the younger ponderosa pine would need to be thinned out for them to grow large enough to be able to endure fire. In many places, timber harvest has removed the large pines. In other places, the big trees are so stressed from high understory stem densities that needle diseases and bark beetles are killing them at high rates.

Historically, ponderosa pine forests developed because frequent low-intensity surface fires killed the competing conifers and prepared a seedbed for the pine (Steele 1987). Low-intensity fires helped maintain them because sapling and larger ponderosa pine are more fire resistant than most other species (Oliver and Ryker 1990; Saveland and Bunting 1987).

Lodgepole Pine

Lodgepole pine *(Pinus contorta)* is the main cover type on a large portion of the Northern Rockies affected environment. Extensive landscapes of near-pure lodgepole or lodgepole/spruce/fir are common in the eastern and southern half of the Northern Rockies area. Lodgepole pine grows larger and mixes readily with western larch, grand fir, and western white pine on moister sites in the northern and western portion of the Northern Rockies area.

Lodgepole is a short-lived tree in western Montana and northern Idaho, and long-lived in eastern Montana and the central Rocky Mountains. Lodgepole is fire-adapted, establishing itself on burned areas (Lotan et al. 1985). Stocking can be as high as 10,000 to 40,000 stems per acre. Most lodgepole forests in the Rocky Mountains were established because of fire.

Historically, fire burned more frequently in lodgepole pine than previously believed. It used to be considered that lodgepole forests were merely the result of stand-replacing fires, but research has shown fire-free intervals of only 22 to 50 years in many lodgepole-dominated forests (Lotan et al. 1985), suggesting fire reduced stand densities. This indicates fire plays a role in both establishing and perpetuating lodgepole pine.

The effects of low-intensity fires in lodgepole forests depend on the availability of seed and amount of duff removed. These low-intensity fires removed some trees, allowing others to grow into large trees. Without some disturbance, lodgepole forests become quite dense with small-diameter stems, small crowns and little diversity.

Except for extensive timber harvests in eastern Montana in the 1950s and 1960s, and mountain-pine-beetle salvage harvests in the southeast part of the Northern Rockies area in the 1970s and 1980s, fire suppression has resulted in extensive areas of mature lodgepole.

Much of it is susceptible to infestation by mountain pine beetles – large-scale infestations result in conditions favorable to stand-replacing wildfires or succession to shade-tolerant species (USFS 1998).

GLACIER NATIONAL PARK

Forests cover two-thirds of Glacier National Park's land area. Lodgepole pine is widespread at lower and intermediate elevations, together with western larch and some western white pine on the west side of the Park. The Lake McDonald area supports western red cedar and western hemlock, with spruce, Douglas-fir, and subalpine fir also occurring on the west side. Ponderosa pine occurs near Polebridge. Near the eastern Park boundary, lodgepole pine intergrades with a mix of prairie community, aspen groves, limber pine, and Douglas fir.

The integrity of the Park's plant communities remains largely intact. However, some communities have been affected by human activities, such as introductions of exotic species, resource extraction, land development, and fire exclusion. The unnatural absence of fire has allowed young lodgepole pines to encroach on the meadows, beginning a succession to a forest community that would not occur under a natural fire regime. Sagebrush has begun to dominate some meadows, changing the species composition of the community from what it would have been under a historical 20-year cycle.

Pine or woodland savannahs include quaking aspen and black cottonwood groves, with open lodgepole pine, ponderosa pine, and limber pine stands. Limber pine is confined to the east side of the Park and is afflicted with white pine blister rust. The five needle pines, white pine, limber pine, and whitebark pine are all suffering serious ecological effects as a result of fire exclusion and the exotic blister rust.

Ponderosa pine makes up a minor portion of total conifer stands in the Park and is found only on the west side. It occupies the warmest and driest sites that support forests and grades into savanna communities. Douglas fir occupies slightly cooler, more mesic (moist) sites than ponderosa. The western red cedar and western hemlock forests include nearly every species of tree that grows in the Park. Both require shady conditions for seedling establishment.

Fire has been a major disturbance event that has provided for diversity of plant communities and wildlife habitat in many areas of the Park. However, these natural fire regimes have changed, not only in response to climate but through fire suppression and elimination of the native cultural practice of igniting fires as well. In some vegetation communities, fire exclusion has altered historical age-class structures and the natural forest mosaic. As a result, some forests of mixed-severity fire regimes have been changed to high-severity, stand-replacement fire regimes.

NORTHERN CASCADES

Approximately 105,000 acres of timberlands (1% of timberland in the State) are included in the proposed action area in Washington. Of timberlands in the eastern Washington region, where the proposed action area is located, the majority are National Forest lands (38%), while other

public ownership makes up 12%, forest industry ownership 14%, and other private (primarily Tribal) ownership 36%. In 2003, National forests contributed 8% of regional timber harvest, private lands 59%, Tribal lands 21%, and State and other public lands contributed 12%.

NORTH CASCADES NATIONAL PARK

Dominant forest covertypes above 4,000 feet elevation are characterized by the National Park Service as Pacific Silver fir, Mountain hemlock, Subalpine fir, shrubland, and subalpine meadows covertypes (Table 8).

Pacific Silver Fir Covertype

This Pacific silver fir covertype has the highest basal area (densest stands of large trees) in the North Cascade National Park Complex. It is comprised primarily of Pacific silver fir with western hemlock and Douglas fir associates on lower elevation sites, and mountain hemlock, Alaska yellow cedar, subalpine fir and lodgepole pine associates on higher elevation sites. Pacific silver fir is the potential natural dominant tree species, although young stands are primarily established by more fire tolerant and less shade dependent species such as Douglas fir.

The Pacific silver fir covertype is in the montane region, with an average elevation of 4,585 feet, which is above the western hemlock and Douglas fir covertypes and below the subalpine forests. It is considerably cooler and wetter in the montane, with a short growing season and a significant winter snowpack. The Pacific silver fir covertype is most commonly associated with westside assemblages, although it also is found on north-facing slopes and moist mid-elevation valley bottoms in more easterly locations.

Table 8. Forest Covertypes Predominant Above 4,000 Feet Elevation in North Cascades National Park Complex[1]

COVER TYPE	DOMINANT SPECIES	MINOR SPECIES	PLANT ASSOCIATIONS
Pacific silver fir	Pacific silver fir	Mountain hemlock, Douglas – fir, Western hemlock	Pacific silver fir / Devil's club, Pacific silver fir / Thin-leaved huckleberry (*Vaccinium membranaceum*), Pacific silver fir / Oregon boxwood, Pacific silver fir / Alaska huckleberry (*V. alaskense*), Pacific silver fir / White flowered rhododendron (Rhododendron albiflorum), Pacific silver fir / Fool's huckleberry (*Menziesia ferruginea*)
Mountain Hemlock	Mountain Hemlock	Pacific silver fir, Subalpine fir, Alaskan yellow cedar	Mtn. hemlock / Thin-leaved huckleberry, Mtn. hemlock / Rhododendron albiflorum, Mtn. hemlock / Alaskan huckleberry, Mtn. hemlock / Fool's huckleberry, Mtn. hemlock / Pink mountainheath (*Phyllodoce empetriformis*) – Blue-leaved huckleberry (*V. deliciosum*)
Shrubland	Vine maple (*A. circinatum*), Slide alder (*Alnus* sinuata), Willow (*Salix* spp.), Thimbleberry (*Rubus parviflorus*)		
Subalpine fir	Subalpine fir, Engelmann spruce, Whitebark pine, Subalpine larch	Pacific silver fir, Lodgepole pine, Western white pine, Douglas fir	Subalpine fir / Oregon boxwood (*Pachistima myrsinites*), Subalpine fir / Thin-leaved huckleberry, Subalpine fir / Pink mountainheath

[1] U.S. National Park Service. 2005. Environmental Assessment Fire Management Program: North Cascades National Park Service Complex, Washington. Sedro-Woolley, Washington. 154pp.

Fire return intervals recorded in the Northern Cascades for Pacific silver fir forests are comparatively shorter than in other Pacific silver fir forests of western Washington. For example, at Desolation Peak fire return intervals are between 100 and 200 years, whereas at Mt. Rainier there is a 300- to 535-year interval (Agee 1993). This is primarily due to drier conditions exhibited in the surrounding matrix forests of the Northern Cascades.

Due to the low resistance to fire of Pacific silver fir and most of the conifers in this covertype other than Douglas fir, the majority of trees within the perimeter of wildland fire will die, and these stand replacing fire events will serve as primary sites for regeneration of fir, hemlock, and lodgepole pine.

Mountain Hemlock Covertype

The mountain hemlock covertype is the highest elevation covertype west of the Cascades, with an average elevation of 5,025 feet, and the coolest and wettest conditions in the Complex. The canopy is generally continuous at lower elevations, and grades into open parkland at higher elevations. Mountain hemlock is the dominant tree species, although Pacific silver fir may be the potential natural dominant in the closed forest type where it comprises ⅓ of the basal area and dominates understory regeneration. Other common associates include Alaska yellow cedar on moist sites and Douglas fir and subalpine fir on drier sites.

The plant associations found in this covertype include Mountain hemlock / Thin-leaved huckleberry (*Vaccinium membranaceum*), Mountain hemlock / Rhododendron albiflorum, Mountain hemlock / Alaskan huckleberry (*V. alaskense*), Mountain hemlock / Fool's huckleberry (*Menziesia ferruginea*) and Mountain hemlock / Pink mountainheath (*Phyllodoce empetriformis*) - Blue-leaved huckleberry (*V. deliciosum*).

Subalpine Fir Covertype

The subalpine fir covertype is the eastside equivalent of the mountain hemlock covertype. Although it is not quite as moist as its coastal counterpart, it is the highest, coolest and wettest zone east of the Cascades. Like the mountain hemlock covertype, there is a closed forest type and an open parkland community.

Appropriately, subalpine fir is the dominant, seral and potential natural species in this covertype; however, Engelmann spruce also is prominent in these stands, along with Pacific silver fir and mountain hemlock. On dry ridges, the open parklands in the subalpine fir covertype usually contain a considerable amount of whitebark pine and subalpine larch. These species often occur in their stunted Krummholz form on ridgetops and in rocky basins. Whitebark pine is most prevalent on the drier sites, whereas subalpine larch dominates the coldest treeline habitats in the Park. The Subalpine fir / Oregon boxwood (*Pachistima myrsinites*), Subalpine fir / Thin-leaved huckleberry (*Vaccinium membranaceum*), and Subalpine fir / Pink mountainheath (*Phyllodoce empetriformis*) plant associations occur in this covertype.

The fire regimes of the subalpine forest types, mountain hemlock and subalpine fir are both classified as a fire regime V in which fire free intervals are greater than 200 years, and where high fire severity fire creates stand replacement. A study reconstructing 10,500 years of fire history of a subalpine fire regime was recently completed in the Thunder Creek Watershed of the National Park (Prichard 2003). This reconstruction, based on charcoal, macrofossil and pollen records in a lake sediment core, documented fire frequency that fluctuated between 30 to 400 years.

Fire intervals in whitebark pine/subalpine larch forests may be slightly shorter, and thus are classified in fire regime IV. Agee summarized whitebark pine research, which has primarily occurred in the Rocky Mountains, noting that fire-return intervals range from long intervals similar to the lower subalpine forests, to intervals as frequent as 30 years (Agee 1993, Morgan and Bunting 1990).

Shrubland Covertype

Shrubs are the dominant vegetation type on the steep, moist slopes of avalanche chutes. Sitka alder, willows and vine maple dominate these sites. This covertype also occurs in wetlands, drainages, and some sites that have recently burned. The shrubland covertype delineated by Pacific Meridian did not accurately distinguish between the vaccinium and heather shrublands of subalpine meadows, which occur at the highest elevations in the Complex, and those of avalanche chutes, which occur from base to height of avalanches. Therefore, the average elevation is somewhat skewed for both the subalpine meadow and shrubland covertypes.

3.4 Fuels, Fire and Fire Ecology

3.4.1 Background

Natural disturbances such as fire, wind, and insects and diseases, help shape forests. In the Rocky Mountain region, periodic fire is the dominant disturbance process that changes forests. While fire is widespread, it's seldom uniform. Every forest has its own characteristic pattern of fire intensity, frequency and size. **Fire regime** and **condition class** are used to characterize fire.

FIRE REGIME

The fire regime describes the historic pattern of fire: how often (frequency); how hot (intensity); and how big (scale). Ecologists often describe three fire regimes for Western forests – **understory, mixed severity** and **stand replacing** (Agee 1993; Brown and Smith 2000; Fischer and Bradley 1987; Hessburg and Agee 2003; Keane et al. 2002; Smith and Fisher 1997).

- **Understory** – Understory fires burn frequently, from once a year, to about once every 35 years, as low-intensity surface fires that consume forest litter and kill small trees in small patches. Understory fires generally do not kill large, fire-resistant trees or substantially change the structure of the forest.

- **Mixed Severity** – Mixed-severity fires burn about every 35-100 years, as a mixture of understory and stand-replacing fires, or as intermediate-intensity fires that kill fire-susceptible trees while the fire-tolerant trees survive. Mixed-severity fires produce a diverse forest in terms of both structure and species composition. The fires are medium sized.
- **Stand Replacing** – Stand-replacing fires are infrequent, burning about every 100-200 years. Stand-replacing fires are large and high-intensity, killing most trees. They make way for a new forest.

Historically, fires at lower elevations tended to be understory and fires at higher elevations stand-replacing, although substantial variability has always existed.

CONDITION CLASS

Condition class describes the departure from historic conditions based on the number of missed fire cycles and the amount of change in forest structure and species composition (Schmidt et al. 2002).

- **Condition Class 1** – Fires have burned as often as they did historically; the risk of losing key ecosystem components is low. Vegetation composition and structure is intact and functioning.
- **Condition Class 2** – Fires have not burned as often as they did historically, missing one or more cycles. The risk of losing ecosystem components is moderate, with moderate changes in fire size, intensity, landscape patterns or vegetation.
- **Condition Class 3** – Fires have significantly departed from their historic frequency by missing multiple cycles. The risk of losing ecosystem components is high, with dramatic changes to fire size, intensity, landscape patterns or vegetation.

Lynx habitat occurs in three kinds of forests in the proposed action area:

- Mixed conifer, which includes Douglas fir, western larch, grand fir and western red cedar
- Spruce/fir, which includes Engelmann spruce, subalpine fir, alpine larch, hemlock, and whitebark pine
- Lodgepole pine

3.4.2 Policy

After 1910, when wildfires burned 3 million acres and killed 85 people in northern Idaho and western Montana, the USFS began to direct serious efforts toward suppressing wildfires. Severe fires occurred again in 1919, 1924, 1925, and 1934. In 1935, the agency adopted the "10 am policy," which said all fires were to be controlled by 10 am the day following their discovery. The policy was repealed in 1973 as the agency shifted from simply controlling fire to managing it and using it as a tool on Federal lands.

Fire suppression for the last 80 years, along with grazing and logging, has changed the way fires burn and changed the age, species and structure of some forests (Quigley et al. 1996). Further, as people have built more homes in the woods, the ability to allow fire has decreased even as the fire risk has increased.

The results of excluding fire became increasingly apparent during the last decade of the 20th century. The Federal government reexamined wildland fire policies. In 1995, the Federal Wildland Fire Management Policy was written to recognize the essential and inevitable role of fire, and the need to return, not eliminate, fire from forests.

Other recent documents set goals for wildland fire policy:

- Managing the Impact of Wildfires on Communities and the Environment - the National Fire Plan (USFS and DOI 2000).
- A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment – 10-Year Comprehensive Strategy (USFS 2001).

They set goals to:

- Improve fire prevention and suppression
- Promote community assistance
- Restore fire-adapted ecosystems (rehabilitate the land after fire)
- Reduce hazardous fuels

Another recent document, The Development of a Collaborative Fuel Treatment Program (USFS et al. 2003), describes criteria for selecting fuel treatment projects. The multi-party memorandum of understanding defines high-priority areas as the Wildland Urban Interface (WUI) and Condition Classes 2 and 3 outside the WUI.

MINNESOTA

In Minnesota, the short interval fire-adapted species like red and white pine had an average fire return interval of 22 years in Itasca State Park (USFS 2004c). In the Boundary Waters Canoe Area Wilderness, a natural fire rotation of 50 to 100 years was documented by Heinselman, with more frequent, low intensity surface fires in the red and white pine (25 years), and less frequent, high-intensity surface and crown fires occurring in jack pine and spruce/fir types (50 to 80 years) (Heinselman 1973).

Changes in the historical fire regimes in these ecosystems today have produced live and dead fuel buildups in the understory of the red and white pine. In addition, little natural regeneration is occurring in these stands due to lack of disturbance. Jack pine in the Boundary Waters Canoe Area Wilderness is expected to decline as well without fire. At the same time, increases in the spruce/fir type has led to increased frequency of spruce budworm epidemics which, in turn, produces an increased fuel hazard from the bug-killed trees. Effects of lack of fire on wildlife

also are of concern. Probably one of the most dramatic examples is the decline of sharptail grouse as a result of fire exclusion from the grassland-brushland ecosystems of the Minnesota, as documented by Berg (1979).

The northern and eastern part of the Superior, including the Boundary Waters Canoe Area Wilderness, tend to have drier, more shallow soils, and can have a significant summer fire problem if rainfall is below normal. Vegetation in this area tends to be more boreal with a higher component of spruce/fir. Reoccurring spruce budworm outbreaks help create large amounts of dead woody fuel, which is compounded by windthrow from thunderstorm microbursts on a regular basis. This fuel complex has helped produce several large, high intensity wildfires in the last few years (Superior National Forest 1996). Timber harvest, followed by post sale prescribed burning, has been useful in treating this fuel complex outside the Boundary Waters Canoe Area Wilderness. Within the Boundary Waters Canoe Area Wilderness, prescribed natural fire is just beginning to help breakup the somewhat homogenous age class and vegetation types which have been conducive to spruce budworm outbreaks.

The net effect of the alteration of historic fire return intervals has increased fuel accumulations above historic levels over large, continuous areas. The possible consequences include:

- Increased risk of large, severe fires
- Increased risk of losing key components that define ecosystems
- Increased risk of serious injury or loss of life to firefighters and the general public
- Increased risk of health effects due to smoke and visibility impairment
- Increased risk of property loss and damage to landscapes that have economic value to people
- Increased fire suppression costs

Fire Management is an appropriate issue for revision because changes in national fire management policy, based on advances in the field of ecology, directs that "fire, as a critical natural process, will be integrated in land and resource management plans and activities on a landscape scale" (U.S. Department of Agriculture [USDA] and USDI 1995).

NORTHERN ROCKY MOUNTAINS

In mid-elevation mixed conifer forests, fires range from understory to stand replacing (USFS 2004a). Fire suppression has limited how often fires burn. Some places have missed one or more fire cycles and fall into Condition Classes 2 or 3. Others are closer to historic conditions, in Condition Class 1. An example, Table 8 describes the fire regimes and condition classes of the three kinds of forests that constitute lynx habitat in Montana.

Today, mixed conifer forests are generally denser and contain fewer fire tolerant species like western larch and ponderosa pine than when low- to intermediate-intensity fires kept parts of the forest thinned out (Quigley et al. 1996). Forest conditions today contribute to greater numbers of large high-intensity fires.

In high-elevation spruce/fir and lodgepole pine forests, infrequent, severe fires are the norm. Because fires burn only about every 100-200 ears in these cold, moist, high-elevation forests, fire suppression has had less of an effect than in other fire regimes. These naturally dense forests are close to historic conditions, generally in Condition Class I.

Excluding fire also has reduced the role played by low- and intermediate-intensity fires. At higher elevations, such fires kill competing fir and spruce trees so whitebark pine can grow and some lodgepole pine can develop old growth characteristics.

Fire suppression has changed the natural age distribution of forests at the landscape level. Stand-replacing fires used to create a mosaic of even-aged forests across the landscape. Today there are proportionately fewer young even-aged forests and more, older forests (Hessburg et al. 1999; Hillis et al. 2003; Losensky 2002). Excluding fire has resulted in a more homogenous landscape with an increased potential for larger stand-replacing fires.

In dry, warm low-elevation forests, frequent low-intensity fires are the norm, maintaining stands of large, widely spaced trees. Fire suppression has resulted in making many of these forests unnaturally dense, and the species composition has shifted away from ponderosa pine to Douglas fir. These forests are where the greatest detrimental effects of excluding fire can be seen. These forests are in Condition Classes 2 and 3; these forests are **not** lynx habitat.

TABLE 9. Lynx Habitat by Forest Type, Fire Regime, and Condition Class in Montana

FOREST TYPE	FIRE REGIME	CONDITION CLASS	EST % LYNX HABITAT
Mixed conifer	Mostly mixed severity	1, 2, or 3	26
Spruce/fir	Mostly stand replacing with some mixed severity	1	40
Lodepole pine	Mostly stand replacing with some mixed severity	1	34

Fuels Program

Congress annually sets goals, program size and emphasis through its appropriations (USFS 2004a). Table 9 summarizes the annual USFS fuels program projected for Montana based on these priorities. In Montana, about 70% of the fuel treatments would occur inside the WUI. Inside the WUI, fuel treatments most likely would be within a mile of structures and designed to reduce the intensity and spread of fire to communities. Many treatments would occur in the dry, low- to mid-elevation forests that have missed one or more fire cycles and are in Condition Classes 2 and 3.

TABLE 10. Projected Annual Fuels Program in Montana

	INSIDE WUI (acres)	OUTSIDE WUI (acres)	TOTAL
Fuels program	**38,000**	**16,000**	**54,000**
Forested, not wilderness	**3,578,000**	**8,335,000**	**11,913,000**

At current funding levels, about 38,000 acres or 1% of the WUI would be treated annually. The other 30% would occur outside the WUI. Outside the WUI, fuel treatments most likely would be designed to restore or maintain a semblance of the forest structure historically produced by fire. Generally, restoration would occur on lands in Condition Classes 2 or 3, and maintenance in Condition Class 1 lands.

Annually about 16,000 acres would be restored or maintained by using prescribed fires and removing vegetation, generally in areas that have missed one or more fire cycles. Vegetation may be removed to reduce fire intensity before burning or as the sole method of treatment.

Each year where wildland fire use is allowed, some acres would be restored or maintained by lightning fires. In Montana, wildland fire use is allowed on about 3 million acres, which includes most wilderness areas and some nonwilderness land. At current funding levels, less than 1% of the area outside the WUI could be treated annually.

3.5 Livestock Grazing Management

MAINE AND MINNESOTA

Little to no livestock grazing occurs in the affected environment in Maine or Minnesota.

NORTHERN ROCKY MOUNTAINS

An active grazing allotment is a place where a term grazing permit is in effect and where livestock grazing is expected to occur most years. Depending on how the allotment is classified and the language in the term grazing permit, this may consist of either cattle or sheep, or occasionally both. In general, the season of use extends from early June to late September, although this varies depending on elevation, plant communities, and management requirements. The Northern Rockies area contains 3,751 Federal grazing allotments. Of these, 1,765 or 47% contain habitat suitable for lynx, and 1,633 of these are active.

The analysis of active grazing allotments containing lynx habitat shows that:

- 38% have less than a ¼ of their acreage in lynx habitat;
- 32% have more than a ¼ but less than ½ of their acreage in lynx habitat;
- 29% have more than ½ of their acreage in lynx habitat; and
- 15% lack management strategies similar to the LCAS.

No livestock grazing occurs in Glacier National Park.

NORTH CASCADES

There are seven grazing allotments on Loomis State Forest, and two on the Loup Loup block. Currently, grazing occurs on 101,027 acres (over 96%) of State lands in the proposed action area. These areas annually support 13,570 AUMs on the Loomis State forest, and 4,851 AUMs on the Loup Loup block. The WADNR draft lynx management plan does not place any additional restrictions on grazing leases beyond compliance with current State regulations. Resource Management Plans are developed on a site-specific basis, and are deigned to maintain native plant communities and plant species diversity, but not to address the specific needs of individual species such as lynx and snowshoe hare.

No livestock grazing occurs in North Cascades National Park.

3.6 Recreation

3.6.1 Definitions

Designated over-the-snow routes are routes managed under permit, agreement, or by the agency, where use is to some extent encouraged either by on-the-ground markings or by publication in brochures, recreation opportunity guides or maps (other than travel maps), or in electronic media produced or approved by the agency. Routes may be marked on the ground with blue or orange diamonds, bamboo wands, blazes, or difficulty markers. Both groomed routes and the routes identified in outfitter and guide permits are designated by definition.

Groomed routes are designated over-the-snow routes on which the snow surface is packed, leveled, or scarified (with or without set tracks) by equipment towed behind a snowmobile or snow-cat. Businesses and groups do most of the grooming. Snowmobile or cross-country ski clubs often obtain permission through permits or agreements to groom certain winter trails. Snow roads maintained by permitted snow-cat tours are considered groomed routes.

Designated play areas are places specifically identified for winter recreation, such as tubing or snowmobiling, but not including developed ski areas.

Routes and areas open, but not designated, many of which are identified on travel maps, are open for winter use, but their use is not encouraged in any way. The routes are not marked on the ground; they are not identified in brochures or other media, except the travel plan map; they are not groomed; they are not under permit or agreement. Some of these routes and areas are routinely used; others are never accessed. This does not apply to routes and areas open to winter use but not designated.

Areas of consistent snow compaction are places generally covered with snow during winter that are used enough to compact the snow so that individual tracks are indistinguishable. In such places, compacted snow is evident most of the time, except immediately after snowfall, within 48 hours. Such places can be areas or linear routes. Compaction may be caused by any human

activity. Areas are generally found near snowmobile or cross-country ski routes; in the nearby openings, parks, and meadows; or near ski huts, plowed roads, or winter parking areas.

Examples include:

- Some of the consistently used routes that are open for public use, but not groomed or designated;
- Sledding or snow play areas close to plowed roads;
- Helicopter landing sites regularly used for heli-skiing;
- Ends of the snow roads used for snow-cat tours; and
- Small lakes with little wind scour where people go ice fishing regularly.

MAINE

Snowmobiling in Maine occurs primarily on private and State lands (Industrial Economics, Inc. 2006). Snowmobile registrations have grown steadily since the mid 1990s, totaling over 100,000 machines in 2004-2005. Snowmobiling in Maine occurs primarily in the "tourist belt" that reaches from Maine's northern coast and then west towards less populated areas. The western trails are wider and longer and attract more snowmobilers. While there have been few changes to the extent of Maine's snowmobile trails, trail routes change within existing road networks from year to year in response to private landowners' logging activities and other requirements. Some increase in groomed trails for cross-country skiing is expected but as the sport is not as formally organized as other winter sports, little information is available.

MINNESOTA

Snowmobiling in Minnesota is focused in the northeast region of the State which experiences high quality snow over a long winter season (Industrial Economics, Inc. 2006). There are 20,000 miles of trails Statewide, and over 277,000 snowmobiles were registered in the State in 2004. Portions of four State trails fall within the proposed action area. The North Shore trail experiences the most use.

Local trails also cross a combination of Federal, State, and county lands, as well as corporate timber and paper company lands, and private lands within the proposed action area. Some corporate lands are being closed to snowmobile recreation due to changes in management or that selling for development or hunting leases is more profitable. No such closures are presently planned in the proposed action area, but may limit trails in the future. The demand for snowmobile trails is expected to remain flat with the majority of trail work currently related to maintenance and not construction of new trails.

Some increase in groomed trails for cross-country skiing is expected but as the sport is not as formally organized as other winter sports, little information is available.

NORTHERN ROCKY MOUNTAINS

The Northern Rockies has some of the most pristine and scenic wild lands in the United States (USFS 2004a). The area receives several million visitors in all seasons of the year because of its beauty and uncrowded backcountry (USFS 1998). This section focuses on winter recreational activities which have the most effect on lynx habitat. Recreational facilities designed for summer use have very little effect on lynx (Ruediger et al. 2000, p. 2-9).

Travel Plans

Management direction on National Forest lands for winter recreation comes from existing Forest Management plans. Generally, they identify where motorized and non-motorized use may occur during what seasons, and they distribute lands into various allocations limiting and directing how

those areas can be used. Motorized use is not allowed in the more than 5 million wilderness-area acres of lynx habitat. Motorized winter recreation may be allowed in some roadless areas or wilderness study areas.

Over-the-snow Recreation

Nationally, snowmobile use grew 34% from 1988 to 1995 (USFS 1997), much faster than the overall population. Snowmobiling is the second most popular winter sport (Cordell 1999). Increased use has led to increased demands for expanded routes. Table 13 shows the trend in the number of registered snowmobiles in Northern Rockies area States. This information is useful in gauging the popularity of snowmobiling, an outdoor activity for which precise estimates of use over time are difficult to obtain. Snowmobile technology has changed rapidly in recent years, making larger, more powerful, and quieter machines available. These new machines let people access previously inaccessible backcountry.

TABLE 11. Growth in Number of Snowmobiles Registered by State

STATE	REGISTERED SNOWMOBILES		AVERAGE GROWTH	
	1989 – 1991	2000 – 2001	Registered Snowmobiles	State Population
Idaho	21,532 in 1991	38,158 in 2001	2.3%	2.5%
Montana	15,100 in 1991	24,600 in 2001	5.0%	1.2%

Data from Idaho Department of Parks and Recreation (2004); Montana Department of Fish, Wildlife and Parks (Walker 2002).

Routes and Areas

People use snowmobiles, snow cats, snowshoes, cross-country skis, and dog sleds on winter trails. In the year 2000, about 3,500 miles of snowmobile trails were groomed in Idaho and Montana. This includes routes outside Federal lands. Which routes are groomed changes from year to year depending on snow conditions and funding. In National Forests, money to pay for grooming snowmobile trails comes from State snowmobile registration funds and a small percentage of gasoline taxes.

Outfitter Permits

A total of 359 permits or agreements authorize winter recreation in the Northern Rockies area, but not all are within the proposed action area (see Table 14). Within the proposed action area the Idaho Panhandle Forests in Idaho and the Lewis and Clark, and Lolo National Forests in Montana have the most permits and agreements authorizing winter recreation in lynx habitat. The BLM has none. Winter outfitters and guides provide a service to people who lack the skills or equipment to participate in winter activities, such as snowmobiling, cross-country or helicopter skiing, and late winter/early spring big game hunting. They provide jobs and income to many small rural western communities. The number of outfitter and guide permits, and their level of use have remained relatively steady over the past decade. Generally, new permits or increases in service-days have been issued only when existing permits terminate, or when other outfitters decrease their permitted service-days. A decade ago there was very little outfitted use during winter. Traditionally outfitters in the Northern Region offered hunting trips. Over the past 5-10 years, public demands for family-oriented vacations have increased and the availability of game animals has decreased. Outfitters have responded by diversifying their businesses and changing the season-of-use in their permits. This has caused an increase in outfitted snowmobiling, cross-country skiing, etc., during the last decade. However, the change in season-of-use has not resulted in major increases in overall outfitter-guide use.

TABLE 12. Number of Recreation Special-use Permits and Agreements

	USFS LANDS				BLM LANDS		TOTALS
	Idaho	Montana	Utah	Wyoming	Idaho	Utah	
All recreation permits and agreements	735	1,114	24	849	0	0	2,722
Winter recreation permits and agreements	86	121	2	150	0	0	359
Winter recreation permits and agreements in lynx habitat	77 (90%)	115 (95%)	2 (100%)	144 (96%)	0	0	338 (94%)

Ski Areas - Rocky Mountains

Due to a variety of factors, the Rocky Mountain region is uniquely well suited to the development of ski areas (USFS 2004a, 2004b). Due to its continental climate and relatively high elevations, this area experiences long, cold winters accompanied by reliable snow that is relatively dry and remains soft due to the infrequency of freeze-thaw and rain events. Additionally, due to their expanse, these mountains contain numerous sites that posses the terrain features, such as slope, aspect, and vertical relief that make them well suited for ski area development. Historic settlement patterns have created the basic infrastructure and population base to support the development and successful operation of ski based resorts.

In 1997, the USFS conducted a nation-wide survey that found downhill ski visits increased by 58%, an increase even more dramatic than snowmobiling (USFS 1997). Snowboarding, the improvements in skis, and success in the 2002 winter Olympics, have all contributed to the expanding popularity of skiing. Increased use results in increased demand for more and larger ski areas.

There is considerable diversity in the ski areas and resorts in the Rocky Mountain region. Some are purely ski areas operating only in the late fall winter and early spring while others are four season resorts that operate most of the year.

Ski areas and resorts include developments such as ski trails, tramways, and ancillary facilities such as restaurants, maintenance buildings, snow making ponds, and parking lots. Ski areas that operated only during the ski season are generally of smaller scale than four season resorts and development of private land at or adjacent to their base areas is less common and extensive.

Four season resorts are usually more highly developed with skiing and snowboarding occurring in the winter and spring and hiking and mountain biking occurring in the summer. These resorts also are associated with development on private land at or adjacent to their base areas. These developments frequently include commercial and private lodging, restaurants, bars, retail shops, golf courses, other recreational amenities, and an associated road network.

The northern Rocky Mountain region contains 53 downhill and cross-country ski areas; 29 are in lynx habitat. Downhill ski areas usually are highly developed recreation areas. Cross-country ski areas are usually less developed.

NORTHERN CASCADES

Snowmobiling occurs on Federal, State, and private lands within the proposed action area in Washington State (Industrial Economics, Inc. 2006). There are a total of 3,000-3,500 miles of groomed trails in Washington State, of which only 29 miles are in the proposed action area. A 43% increase in the number of people participating in snowmobiling by 2013 is predicted for the State. Snowmobiling occurs on the Loup Loup block area and on Loomis State Forest trails that are connected to the Okanogan-Wenatchee National Forest trail network. The area is remote, and most snowmobile riding in the Loomis area is on ungroomed trails. Creation of new snowmobile trails is precluded in the Washington Department of Natural resources draft lynx management plan and there is no encouragement for additional use of existing trails.

Some increase in groomed trails for cross-country skiing is expected but as the sport is not as formally organized as other winter sports, little information is available.

3.7 Minerals

A wide variety of mineral and energy resources occur on lands with lynx habitats encompassed by Alternative B. Since some of the area analyzed for possible designation as critical habitat in Alternative B includes public and private lands subject to mining, the following descriptions focus on those lands.

No mineral or energy extraction occurs on lands of the three National Parks that comprise Alternative C.

3.7.1 Definitions

Surface-disturbing activities associated with mineral and energy resources typically include (USFS 2004a):

- **Prospecting -** Prospecting is identifying an area with potential for mineral development. It involves limited surface disturbance, such as geologic mapping, or soil or water sampling. Prospecting for oil and gas often involves collecting seismic data.
- **Exploration -** Exploration is physically searching for minerals. It often includes building roads, drill pads, underground workings, and trenching.
- **Development** - Development is the work required to prepare a mineral deposit for production. It may include driving underground workings, stripping the overburden from deposits that will be open-pit or strip mined, building waste dumps, and constructing milling and transporting facilities. Oil and gas development includes drilling a series of production wells and building access roads.
- **Production** - Production is removing a mineral from the ground and making it available for final processing and consumption.
- **Reclamation** - Reclamation is restoring the areas disturbed during exploration, development, and production.

3.7.2 Management Constraints

The status of the land affects the legal authorities that apply to management and disposal of minerals. Land is in one of the following status categories:

- Lands reserved from the public domain;
- Acquired lands;
- Lands with outstanding or reserved rights; or
- Private land with federally owned minerals

Mineral resources may be classified into three categories:

- Mineral materials;
- Locatable minerals; or
- Leasable minerals

The combination of land status and the type of mineral resource define a land management agency's management authority.

MAINE

All active mining operations in the proposed action area are small-scale crushed stone quarries and sand and gravel pits (Industrial Economics, Inc. 2006). Most sites are on private, dry land that has been cleared expressly for the intent of mining operations. Most of the expected new mining operations will take place outside the proposed action area.

MINNESOTA

Iron ore production makes up the majority of Minnesota's non-fuel mineral production at 79% (Industrial Economics, Inc. 2006). Minnesota is ranked first for iron ore production in the United States. Taconite, a low-grade iron ore used in steel production, is the primary extraction. All current taconite mining and exploration in the State occurs in the Mesabi Range, ⅓ of which is located either within or adjacent to the proposed action area. The increased global demand for construction steel is expected to lead to the development of new steel production plants in the Great Lakes area and thus an increased demand for taconite.

Additionally, small sand and gravel operations are actively producing in the proposed action area. One peat operation is currently active. Although the State leases 11,750 acres within the proposed action area for mineral development, no mines are active and none are expected to be active in the near future.

NORTHERN ROCKY MOUNTAINS

Mineral Materials

Mineral materials are common minerals such as stone, gravel, clay, cinders, and decorative rock, whose disposal is authorized under the Materials Act of 1947. This act provides for disposing of mineral materials on public lands through bidding, negotiated contracts, or free use. The USFS and BLM have full authority to make decisions about disposing of mineral materials on lands of all status categories.

The USFS and BLM use mineral materials from their lands for building and surfacing system roads and may sell these mineral materials, or issue free-use permits to State and county governments for public projects such as highway construction and maintenance. All contracts contain requirements for reclaiming sites to pre-mining conditions as much as possible.

There are about 2,600 active mineral-material sites on National Forest lands where lynx habitat is located. In Fiscal Year 2000, about 800,000 tons of mineral materials worth more than $2.8 million were removed from these lands. About one-fourth was removed by the USFS for its own use. Demand for mineral materials is expected to grow as demand increases for public and private infrastructure. The largest increases have been for the very small, free-use permits issued to private individuals for a ton of material or less (a pick-up load). These free-use permit sites rarely result in a pit or need more than minor reclamation.

Excavation, temporary storage, and transport are associated with removing mineral materials at some sites. Typically, sites are small, less than five acres. Most are near or next to roads and do not require substantial amounts of new road. The small, free use permits are almost all next to existing roads.

Mineral material sites seldom overlap the high-elevation, remote places where lynx habitat occurs. Only 2 to 3% of mineral-materials sites permitted in the last 15 years were in lynx habitat. Presently, only one mineral-material site in lynx habitat has winter operations. It is anticipated that this proportion will continue in the future.

Locatable Minerals

Locatable minerals, such as gold, silver, copper, and other metals, are subject to the General Mining Law of 1872 as amended. This law grants a statutory right to explore for and develop these minerals, unless the land has been formally withdrawn from mineral entry. The USFS authority is directed at using the surface of National Forest lands (30 U.S.C. 21-54). The USFS may not deny proposed operations or make them impossible by imposing unreasonably restrictive management requirements or conditions. However, the USFS may require mitigation and list requirements to minimize adverse impacts.

Both BLM and USFS regulations say mining operations should minimize adverse environmental impacts to surface resources. The BLM regulations say they are to prevent "unnecessary and undue degradation" and to avoid adverse effects on threatened and endangered species. The USFS regulations include "taking all practicable measures" to maintain and protect wildlife habitat, and to reclaim surface disturbances including rehabilitating wildlife habitat. The USFS regulations also require that roads be built and maintained to minimize or eliminate damage to other resources including wildlife. Unless otherwise authorized, roads that are no longer needed are to be closed, bridges and culverts removed, and the road surface shaped to a natural contour and stabilized.

Current Situation

The area where lynx habitat occurs has a long history of locatable hard-rock minerals activity, mostly exploring and mining for lode gold, silver, copper, and other metals. Today, this usually takes place in historic mining areas, or where more recent interpretations of the geology lead to the discovery and production of economically valuable deposits.

Mining has waned since the late 1800s. Only a fraction of the historic sites operate today, and those that continue, do so with much more stringent environmental protection measures. Most recent activity involves maintaining existing facilities; however, there are few new exploration and production sites. Typically, motorized vehicles use established routes for access. New access requires project-specific analysis and approval.

The majority of surface disturbances are less than 20 acres. Presently there are five larger locatable operations ranging from 100 to 600 acres on National Forest lands in lynx habitat, all in Montana. Only two are operating; the other three are in the care-and-maintenance or reclamation phases.

Based on the minerals database maintained by USFS Regions 1 and 4, which covers the last 15 years, about one-third of all Notices of Intent and Plans of Operation were for sites in lynx habitat. In Fiscal Year 2000, the USFS processed 142 Plans of Operation and received 550 Notices of Intent. We anticipate this trend will continue in the future.

Future locatable mineral activity is likely to occur in areas of existing operations and where the geology is favorable for economically viable mines. Significant increases in the level of future exploration or development are not expected; the potential for future large mineral discoveries is considered low but possible.

Leasable Minerals

Leasable materials are federally owned fossil fuels (oil, gas, coal, oil shale, etc.), geothermal resources, sulfur, and phosphates that are subject to exploration and development under leases, permits, or licenses issued by the Secretary of DOI, with USFS input on National Forest System lands. The 1920 Mineral Leasing Act, as amended, together with the 1987 Federal Onshore Oil and Gas Leasing Reform Act, provide the authority and management direction for Federal leasable minerals on Federal lands. In 1970, the Geothermal Steam Act added steam to the list of minerals that could be leased on National Forest System lands.

Regulations at 36 CFR 228.108 require oil and gas operators to comply with ESA during operations. They require roads and surface disturbances to be reshaped and revegetated when closed or abandoned. Mining operators also are obliged to post reclamation bonds to make sure reclamation takes place. Most existing plans include standards and guidelines for reclaiming mining operations.

Acquired Lands (hard-rock minerals)

Hard-rock minerals described as locatable on public-domain lands are described as leasable on lands acquired by USFS or BLM after 1891. On lands where the agencies acquired mineral as well as surface rights, BLM issues the prospecting permits and leases for hard-rock minerals. On National Forest acquired lands, BLM must first obtain the consent of USFS.

Oil, Gas, Coal, or Geothermal

The BLM issues oil and gas, coal, and geothermal leases. The most common leases in this area are oil and gas leases which are issued for 10-year terms. Leasing decisions and development decisions are made in two stages:

- First, the USFS makes a lease decision about which lands will be open for leasing, based on an analysis of the known impacts of exploration and development. This decision identifies which areas will be open to development subject to standard lease terms, which areas will be open to development subject to constraints, called lease stipulations, and which will be closed to leasing. The USFS informs BLM of the results and BLM is responsible for issuing the lease.

- Then, after a lease is issued, the lessee has legal rights to explore and develop, subject to the terms of the lease and other applicable State and Federal laws. The lessee must obtain approval from BLM and USFS for post-lease activities. This is when site-specific resource protection measures are developed and are applied as conditions of approval for the surface-use plan of operations. Such measures must be within the scope of the rights granted under the terms of the lease.

Solid Nonenergy Leasable Materials

The BLM also issues 10-year term leases for solid nonenergy leasable materials, such as phosphate or sodium. The USFS has no consent authority, but BLM generally accepts USFS recommendations.

Current Situation

The oil and gas industry has been stable during the past decade, but is projected to grow. Currently in the Northern Rockies area, about 820,000 acres are under lease for oil and gas, with more acres pending. Transmission pipelines are an integral part of the infrastructure associated with oil and gas production. Presently, there are no pipelines in lynx habitat.

All leases say that before any disturbance may occur, surveys or studies may be needed to determine the extent of impacts on resources and whether mitigation would be required. Leases also say that if threatened or endangered species are observed during operations, the lessee shall stop doing anything that would result in the destruction of the species.

Lands With Outstanding or Reserved Rights

Private parties own some of the minerals on National Forest lands. Most of the National Forest lands in the northern Rockies were reserved from the public domain under the Forest Reserve Act of 1891. Since then, other lands have been acquired. The titles to some of these lands are encumbered with reservations, that is, in some cases the previous owner reserved the mineral rights. In other cases, mineral rights were separated from the surface estate before the Federal government acquired the surface. These mineral rights are outstanding to third parties. A very small percentage of lands in the areas with lynx habitat have reserved or outstanding rights.

These reserved and outstanding rights represent property interests in the land. Although the Federal government owns and administers the surface, the mineral owner has certain rights as well. The most important of these is the right to access and develop the minerals. Other rights may be spelled out in individual deeds. The USFS must consider these property interests during planning and implementation.

NORTHERN CASCADES

No active mining operations were identified within the North-Cascades section of the proposed action area.

3.8 Transportation

MAINE

The Maine Department of Transportation has a total of nine projects proposed within the affected environment over the next 3 years ranging from replacing a culvert or struts to completely rebuilding stretches of highway (Industrial Economics, Inc. 2006).

MINNESOTA

Projects are proposed in the affected environment which could further fragment lynx habitat, including expanding a highway from two to four lanes (Industrial Economics, Inc. 2006). Other projects in the proposed action area are primarily safety measures including widening of shoulders and construction of passing lanes.

ROCKY MOUNTAIN REGION

Transportation activities affecting lynx or its habitat include bridge construction, repair, or replacement, and road construction, repair, widening, or improvements (Industrial Economics, Inc. 2006). These activities reduce connectivity within the boreal forest landscape and increase the species' vulnerability to vehicle collision. Lynx are highly mobile and frequently cross roads during dispersal, exploratory movements, or travel within home ranges. Highway projects also may directly affect the amount of feeding and denning habitat for the species by converting natural forests into road surface, rights-of-ways, or associated facilities such as maintenance areas or gravel pits.

Highways can alter landscapes by fragmenting large tracts of land (USFS 2004a). As the standard of road increases from gravel to two-lane highway, traffic volume increases. According to the LCAS, lynx may become intimidated by traffic and may not cross highways when the volume reaches from 2,000-4,000 vehicles per day, particularly if traffic continues during the night. Parts of various highways traverse lynx linkage areas.

The degree of impact increases as highways are upgraded from two lanes to four. Four-lane highways commonly have fences on each side, service roads, paralleling railroads and other impediments such as 'Jersey barriers' that make crossing even more difficult. The States of Idaho and Montana are evaluating ways to provide wildlife crossings and implementing their findings in their highway reconstruction plans.

The Federal Land Management agencies, including the Service (look up Ecological) are part of the steering team that produced the document entitled *Eco-Logical: An Ecosystem Approach to Developing Infrastructure Projects* (Federal Highway Administration, 2006). It embodies the intent and principles of the NEPA and Executive Order 13352 on Facilitation of Cooperative Conservation, and offers a framework for achieving greater interagency cooperative conservation. *Eco-Logical* provides a nonprescriptive approach that enables Federal, State, Tribal, and local partners involved in infrastructure planning, design, review, and construction to work together to make infrastructure more sensitive to wildlife and their ecosystems. It recognizes open public and stakeholder involvement as the cornerstone for cooperative conservation.

NORTHERN CASCADES

There are no transportation-related activities proposed in the affected environment for the North Cascades for at least 20 years other than routine maintenance (Industrial Economics, Inc. 2006).

3.9 Historical and Cultural Resources

Conservation of sensitive, threatened, or endangered species habitat, and reintroduction of endemic or native species into their historical habitats in ways that do not involve surface disturbance, does not have the potential to affect historic properties. Specific projects to protect critical habitat will describe affected resources and analyze effects to historical and cultural resources.

3.10 Social and Economic

A draft economic analysis of critical habitat designation for lynx has been developed (Industrial Economics, Inc. 2006). The analysis assesses the economic costs incurred since the species was listed as well as costs that would be incurred with designation. The scope of the economic analysis includes those areas included in the proposed designation (Service 2005a, 2006). The contents of this analysis are incorporated by reference.

3.11 Tribal Lands

Tribal lands occur within the geographic range of the Alternative B (see Table 7). In accordance with Secretarial Order 3206, "American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act" (June 5, 1997); the President's memorandum of April 29, 1994, "Government-to-Government Relations with Native American Tribal Governments" (59 FR 22951); Executive Order 13175 "Consultation and Coordination with Indian Tribal Governments;" and the relevant provision of the Departmental Manual of DOI

(512 DM 2), the Service believes that fish, wildlife, and other natural resources on Tribal lands are better managed under Tribal authorities, policies, and programs than through Federal regulation wherever possible and practicable.

TABLE 13.
Tribal Lands Excluded from Consideration as Critical Habitat by Action Alternatives

HABITAT UNIT	TRIBAL ENTITY
Maine	Houlton Band of Maliseet Indians
	Aroostook Band of Micmac Indians
	Passamaquoddy Tribe
	Penobscot Indian Nation
Minnesota	Grand Portage Indian Reservation
	Vermillion Lake Indian Reservation
Northern Rocky Mountains	None
Northern Cascades	None

4. ENVIRONMENTAL CONSEQUENCES

Designation of critical habitat does not have any direct effects on the environment, except through the section 7 consultation process. This is because critical habitat designation does not impose broad rules or restrictions on land use, nor does it automatically prohibit any land use activity. Each Federal action that could potentially affect designated critical habitat is analyzed individually during the section 7 consultation process. Individuals, organizations, local government, Tribes, States, and other non-Federal agencies are potentially affected by the designation of critical habitat only if their actions occur on Federal lands, require a Federal permit or license, or involve Federal funding (e.g., section 404 Clean Water Act permits from the U.S. Army Corps of Engineers or funding of activities by the Natural Resource Conservation Service).

Under section 7, Federal agencies are required to consult with the Service when their actions could affect critical habitat. For many listed species, critical habitat designation would not be expected to materially affect the number or nature of consultations. For instance, when critical habitat and the areas occupied by the species are equivalent, an action that would affect designated critical habitat also would affect the species and a consultation would be required regardless of critical habitat designation.

In the case of the lynx, Federal actions that are likely to destroy or adversely modify critical habitat would typically also result in jeopardy to the species. Federal agencies have been required to ensure that their actions do not jeopardize the continued existence of the lynx since its listing in 2000. In practice, the outcome of section 7 consultation is often similar whether or not critical habitat is designated. Adverse effects on PCEs or portions of critical habitat generally would not result in an adverse modification determination unless that loss, when added to the environmental baseline, is likely to appreciably diminish the capability of the critical

habitat designation to satisfy essential requirements of the species. In other words, activities that may destroy or adversely modify critical habitat include those that alter the PCE to an extent that the value of critical habitat for conservation of the species is appreciably reduced.

Actions that would be expected to both jeopardize the continued existence of the lynx and destroy or adversely modify its critical habitat would include those that significantly and detrimentally alter its habitat over an area large enough that the likelihood of its survival and recovery is significantly reduced. Note that the scale of actions would be a crucial factor in determining whether they would directly or indirectly alter critical habitat to the extent that the value of the critical habitat for the survival and recovery of lynx would be appreciably diminished. Thus, the likelihood of an adverse modification or jeopardy determination would depend on the baseline condition of the species and the critical habitat.

Potential environmental consequences that may result from implementation of the No Action and Action Alternatives are discussed below. All impacts are expected to be indirect, as critical habitat designation does not in itself directly result in any alteration of the environment.

- **Physical Environment**

None of the alternatives would impact the physical environment such as soils, water and air.

- **Fish, Wildlife, and Plants**

Alternative A, the No Action Alternative, would have no impacts on fish, wildlife, or plants beyond those protections already in place as a result of listing of the lynx in 2000 and associated requirements of section 7 of the ESA.

Alternative B would have similar effects on fish, wildlife, and plants, in that there may be minimal beneficial impacts beyond those already considered in section 7 consultations since the 2000 listing. Fish, wildlife, and plants may indirectly benefit as a result of ecosystem protections provided through conservation of the lynx and the associated requirements of section 7(a)(2) of the ESA. As a result of critical habitat designation, Federal agencies may be able to prioritize landowner incentive programs such as the Healthy Forest Reserve Program, and private landowner agreements that benefit the lynx, as well as other fish, wildlife, and plant species. Critical habitat designation also may assist States in prioritizing their conservation and land-managing programs. In other portions of the lynx's range, Alternative B would have no impact on fish, wildlife, and plants beyond those protections already in place as a result of listing of the lynx in 2000 and associated requirements of the ESA.

Under Alternative C, the National Park Alternative, the management objectives of the National Park Service to conserve biodiversity and native natural plant and wildlife communities, and to maintain the supporting ecosystem processes would generally compliment lynx conservation, and would most likely meet the associated requirements of section 7(a)(2) of the ESA. In other portions of the lynx's range, Alternative C would have no impact on fish, wildlife, and plants beyond those protections already in place as a result of listing of the lynx in 2000 and associated requirements of the ESA.

- **Human Environment**

As discussed above, individuals, organizations, States, local governments, and other non-Federal entities are only affected by the designation of critical habitat if their actions occur on Federal lands, require a Federal permit, license, or authorization, or involve Federal funding. Since 2000, Federal agencies have been required to consider the effects of their actions on lynx and consult with the Service as appropriate. While a similar process is required for critical habitat, analysis of effects to critical habitat is not expected to cause large increases in the number or complexity of consultations. This is because no unoccupied habitat has been proposed for designation as critical habitat.

Under Alternative A, the No Action Alternative, no additional section 7 review of habitat on private lands would occur beyond those already resulting from the 2000 listing of the lynx and the associated requirements of section 7 of the ESA.

The Service recognizes a perception may exist within some segments of the public that designating critical habitat under Alternative B would severely limit property rights; however, critical habitat designation has no effect on private actions on private land that do not involve Federal approval or action. We recognize that there are private actions on private lands that involve Federal actions; however, there should already be section 7 consultations taking place in these situations. Differentiating between consultations that result from the listing of the lynx and consultations that result from the presence of critical habitat is difficult. Therefore, the discussion in the sections that follow will disclose the potential impacts associated with all future section 7 consultation in or near critical habitat units, as provided in the Economic Analysis and will describe how much of this cost is likely attributable to critical habitat designation (Industrial Economics, Inc. 2006).

Because section 7 consultations of designated critical habitat would occur only on the lands of three National Parks, Alternative C is not likely to significantly affect private property. The effect of Alternative C (the National Park Alternative) on private lands in the rest of the lynx's range would be similar to Alternative A, the No Action Alternative.

4.3.1 Timber Management-Related Activities

Timber management-related activities are the dominant land use in the areas proposed for critical habitat. Actions that would reduce or remove understory vegetation within boreal forest stands could significantly reduce the quality of snowshoe hare habitat such that the landscape's ability to produce adequate densities of snowshoe hares to support persistent lynx populations is at least temporarily diminished. Such activities could include, but are not limited to, pre-commercial thinning.

Trends in timber harvest volumes, cut volumes and silvicultural techniques would not change with Alternative A, the No Action Alternative, beyond that already resulting from the 2000 listing of the lynx and the associated requirements of section 7 of the ESA. Section 7 consultations on the effects of Federal timber projects on the lynx under the jeopardy standard would still be required.

For Alternative B, critical habitat designation would require re-initiation of some section 7 consultations for timber management. New and ongoing Federal timber management-related projects within designated critical habitat areas would be analyzed under the section 7 consultation process for potential effects to PCEs as well as effects to the species. While habitat is already considered in consultations on effects to the species, the consultations would have to address PCEs. Pre-commercial thinning may be precluded depending on the habitat in the project area, and timber projects may be modified by changing their timing, modifying road access and requiring that a lynx management plan be developed. For projects where there is no Federal nexus, critical habitat designation does not impose rules or restrictions on land use so there would be no changes under the action Alternatives.

Forest timber management on National Parks is generally limited to localized and incidental situations. In some instances, critical habitat designation under Alternative C, the National Park Alternative, may require additional consideration of measures to avoid or minimize impacts to critical habitat and PCEs. Throughout the remaining range of the lynx, the effect of Alternative C, the National Park Alternative, would likely be similar to Alternative A, the No Action Alternative. Section 7 consultations on the effects of Federal timber projects on the lynx under the jeopardy standard would still be required.

4.3.2 Wildland Fire Management

Fuels treatment projects that would reduce or remove understory vegetation within boreal forest stands could significantly reduce the quality of snowshoe hare habitat such that the landscape's ability to produce adequate densities of snowshoe hares to support persistent lynx populations is at least temporarily diminished.

Wildland fire management would not change with Alternative A, the No Action Alternative, beyond that already resulting from the 2000 listing of the lynx and the associated requirements of section 7 of the ESA. Section 7 consultation on the effects of Federal fire management projects on the lynx under the jeopardy standard would still be required.

For Alternative B, critical habitat designation would require re-initiation of some section 7 consultations for wildland fire management. New and ongoing Federal fire management-related projects within designated critical habitat areas would be analyzed under the section 7 consultation process for potential effects to PCEs as well as effects to the species. While habitat is already considered during the consultation process, the consultations would have to address PCEs. The number of projects analyzed would likely not change since habitat is already considered in consultations on effects to the species. Critical habitat designation could require project modifications or restrictions compared to the existing condition. For projects where there is no Federal nexus, critical habitat designation does not impose rules or restrictions on land use so there would be no changes under the Action Alternatives.

For wildland fire management under Alternative C, the National Park Alternative, section 7 consultations may require the three National Parks to consider additional measures to avoid or minimize impacts to critical habitat and PCEs. For other areas of the lynx range, wildland fire

management would not change beyond that already resulting from the 2000 listing of the lynx and the associated requirements of section 7 of the ESA. Section 7 consultations on the effects of Federal fire management projects on the lynx under the jeopardy standard would still be required.

4.3.3 Recreation

Recreational activities that are theorized to have the potential to affect lynx and its habitat include those that are related to winter activities that involve over-the-snow trails such as for snowmobiling and cross-country skiing. Theoretically, lynx or its habitat could be impacted by packed over-the-snow trails that enable potential competitors, such as coyotes or bobcat, to access lynx winter habitat. However, at this time there is no evidence either proving or disproving the theory that packed snowtrails facilitate competition to a level that negatively affects lynx.

Recreation management would not change with Alternative A, the No Action Alternative, beyond that already resulting from the 2000 listing of the lynx and the associated requirements of section 7 of the ESA. Section 7 consultation on the effects of Federal recreation related projects on the lynx under the jeopardy standard would still be required.

For Alternative B, critical habitat designation would require re-initiation of some section 7 consultations for recreational projects. New and ongoing recreation-related projects within designated critical habitat areas would be analyzed under the section 7 consultation process for potential effects to PCEs as well as effects to the species. While habitat is already considered during the consultation process, the consultations would have to address PCEs. For projects where there is no Federal nexus, critical habitat designation does not impose rules or restrictions on land use so there would be no changes under Alternative B.

For Alternative C, critical habitat designation could require reinitiation of some section 7 consultations for recreational management on three National Parks. On these Parks, new and ongoing recreation-related projects within designated critical habitat areas would be analyzed under the section 7 consultation process for potential effects to critical habitat (and PCEs) as well as effects to the species. For all other areas throughout the range of the lynx, due to the listing in 2000, section 7 consultations on the effects of recreation related projects with Federal nexus under the jeopardy standard for the lynx would still be required. Where there is no Federal nexus, federal designation of critical habitat would have no effect on recreational uses.

4.3.4 Commercial and Residential Development/Oil and Gas Leasing/Mines

Actions that would cause permanent loss or conversion of the boreal forest would eliminate and fragment lynx and snowshoe hare habitat. Such activities could include, but are not limited to, commercial, residential or recreational area developments; certain types of mining activities and associated developments.

Development-related projects would not change with Alternative A, the No Action Alternative, beyond that already resulting from the 2000 listing of the lynx and the associated requirements of section 7 of the ESA. Section 7 consultation on the effects of development projects on the lynx under the jeopardy standard would still be required.

For Alternative B, critical habitat designation would require re-initiation of some section 7 consultations for oil and gas, mining and development-related projects. New and ongoing Federal development-related projects within designated critical habitat areas would be analyzed under the section 7 consultation process for potential effects to PCEs as well as effects to the species. While habitat is already considered in consultations on effects to the species, consultations will need to evaluate PCEs. For projects where there is no Federal nexus, critical habitat designation does not impose rules or restrictions on land use, so there would be no changes under the Alternative B.

Because little or no oil and gas leasing, mine or commercial and residential development occurs on the three National Parks, critical habitat designation under Alternative C, the National Park Alternative, would have no impact on development. Throughout the remaining lynx range, development-related projects would not change with Alternative C, the National Park Alternative, beyond that already resulting from the 2000 listing of the lynx and the associated requirements of section 7 of the ESA. Section 7 consultations on the effects of management projects on the lynx under the jeopardy standard would still be required.

4.3.5 Transportation/Highways

Actions that would increase traffic volume and speed on roads that divide lynx critical habitat could reduce connectivity within the boreal forest landscape for lynx and could result in increased mortality of lynx within the critical habitat units as lynx are highly mobile and frequently cross roads during dispersal, exploratory movements or travel within their home ranges.

Transportation-related projects would not change with Alternative A, the No Action Alternative, beyond that already resulting from the 2000 listing of the lynx and the associated requirements of section 7 of the ESA. Section 7 consultation on the effects of Federal fire management projects on the lynx under the jeopardy standard would still be required.

Under Alternative B, existing section 7 consultations may need to be re-initiated to address critical habitat. New and ongoing Federal transportation-related projects within would be analyzed under the section 7 consultation process for potential effects to PCEs as well as effects to the species. Conservation efforts for lynx might include remote monitoring, construction of habitat continuity structures (overcrossings and/or underpasses), bridge lengthening, fencing and development of databases to track key habitat linkages. While habitat is already considered in consultations on effects to the species, consultation will need to evaluate PCEs. For projects where there is no Federal nexus, critical habitat designation does not impose rules or restrictions on land use so there would be no changes associated with Alternative B.

For Alternative C, critical habitat designation may require reinitiation of some section 7 consultations for transportation management on the three National Parks. On these Parks, new and ongoing transportation-related projects within designated critical habitat areas would be analyzed under the section 7 consultation process for potential effects to PCEs as well as effects to the species. Like the No Action Alternative, in all other areas throughout the range of the lynx, section 7 consultations on the effects of recreation related projects with Federal nexus under the jeopardy standard for the lynx would still be required.

4.3.6 Livestock Grazing

Actions that would cause permanent loss or conversion of the boreal forest would eliminate and fragment lynx and snowshoe hare habitat. Such activities could include grazing since it changes the structure or composition of native plant communities, thus changing their ability to support lynx and their prey, snowshoe hare.

Grazing practices would not change with Alternative A, the No Action Alternative, beyond that already resulting from the 2000 listing of the lynx and the associated requirements of section 7 of the ESA. Section 7 consultation on the effects of grazing on the lynx under the jeopardy standard would still be required.

For Alternative B, critical habitat designation would require reinitiation of some section 7 consultations for grazing. New and ongoing grazing authorizations within designated critical habitat areas would be analyzed under the section 7 consultation process for potential effects to PCEs as well as effects to the species. Consultation may require management of sheep and cows to prevent grazing concentration in areas that might contain lynx and snowshoe hare habitat and foraging habitats, using fencing instead of wood debris as a more permanent boundary between grazing areas and lynx/hare habitat, and monitoring and reporting on foraging conditions. While habitat is already considered in consultations on effects to the species, consultations will need to evaluate PCEs. For projects where there is no Federal nexus, critical habitat designation does not impose rules or restrictions on land use so there would be no changes under the Alternative B.

Because little or no livestock grazing occurs on the National Parks, the effect of Alternative C would be the same effect as Alternative A, the No Action Alternative. Under Alternative C, the National Park Alternative, grazing management practices throughout the range of the lynx would not change beyond that already resulting from the 2000 listing of the lynx and the associated requirements of section 7 of the ESA.

4.3.7 Environmental Justice

Federal agencies are required to "identify and address disproportionately high and adverse human health or environmental effects" of their programs and actions on minority populations and low-income populations, as directed by Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations). The areas under consideration for this assessment are rural. This assessment has not identified any adverse or beneficial effects unique to minority or low-income human populations in the affected areas.

4.3.8 Tribal Lands

Under Alternative A, any impacts to Tribal lands would not change, as the section 7 process would only be initiated for "may affect" determinations for lynx. The number of potential consultations would continue to be about the same as under current conditions.

Under Alternative B, it is possible that Tribes described above in this EA may have the perception of increased federal control and involvement in Tribal land management results from critical habitat designation. Moreover, there could be a perception by the Tribes of a diminished ability to manage and control their lands.

Under Alternative C, any impacts to Tribal lands would not change, as the section 7 process would only be initiated for "may affect" determinations for lynx. The number of potential consultations would continue to be about the same as under current conditions.

4.4 Cumulative Impact

Designation of critical habitat for the lynx will add incremental impacts when added to other past, present, and reasonably foreseeable future actions. Actions that could have cumulative impacts would include--1) the section 7 consultation outcomes and subsequent effects on other species; 2) the effects of designated critical habitat for other species; and 3) the effects of land management plans. The Service expects the impacts to be relatively minimal since they would primarily involve re-initiation of section 7 consultations.

There are no Department of Defense lands located within the critical habitat designation of either Alternative B or C, so there will be no impacts to national security. No health and safety issues are anticipated from the either designation.

TABLE 14. Summary of Environmental Consequences by Alternative

ALTERNATIVES			
IMPACTS	**ALTERNATIVE A No Action Alternative**	**ALTERNATIVE B**	**ALTERNATIVE C National Park Alternative**
Physical Environment	No change to existing situation	No change to existing situation	No change to existing situation
Fish, Wildlife and Plants	No change to existing situation	No negative impacts, possible beneficial	No change to existing situation
Human Environment			
Timber Management	No change to existing situation	Timber management may be altered due to critical habitat	No impacts
Wildland Fire Management	No change to existing situation	Wildland fire management may be altered due to critical habitat	Wildland fire management – limited to lands of 3 National Parks – could be modified.
Recreation	No change to existing situation	Critical Habitat may require restrictions or changes to recreational management	Possible restrictions or changes to recreational management - limited only to 3 National Parks
Transportation/ Highways	No change to existing situation	Transportation projects may require lynx conservation measures	No impacts
Development/ Oil & gas/ Mining	No change to existing situation	Development projects may require lynx conservation measures	No impacts
Archaeological/ Cultural	No change to existing situation	No Impacts	No Impacts
Environmental Justice	No change to existing situation	No impacts	No impacts

5. COMPLIANCE, CONSULTATION AND COORDINATION WITH OTHERS

5.1 Compliance With Other Laws and Regulations

The Final Rule for critical habitat designation describes numerous laws and policies that are considered during the rulemaking process.

5.2 Environmental Justice

Environmental justice is achieved when everyone, regardless of race, culture or income, enjoys the same degree of protection from environmental and health hazards and equal access to a healthy environment. None of the alternatives would have an impact upon women, minority groups, or civil rights of any citizen of the United States (Executive Order 12898). No Native American Tribal resources would be negatively affected by the alternatives (Secretarial Order 3206).

5.3 Public Review and Comment

Public review and commenting process is discussed in section 1.2.2 Previous Federal Actions of this Final Environmental Assessment.

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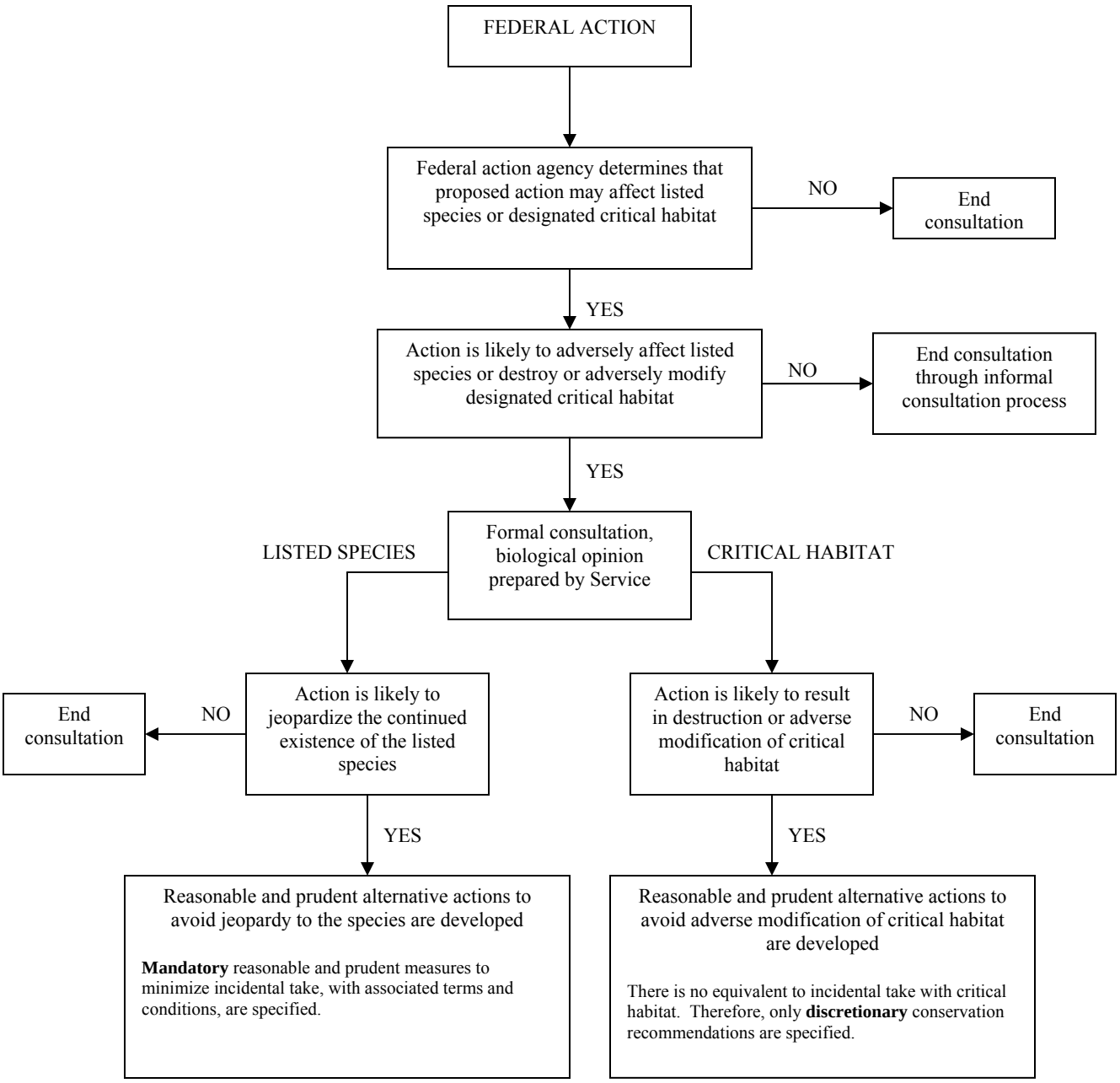

Figure 1. Endangered Species Act section 7 process showing the parallel track for listed species and designated critical habitat.

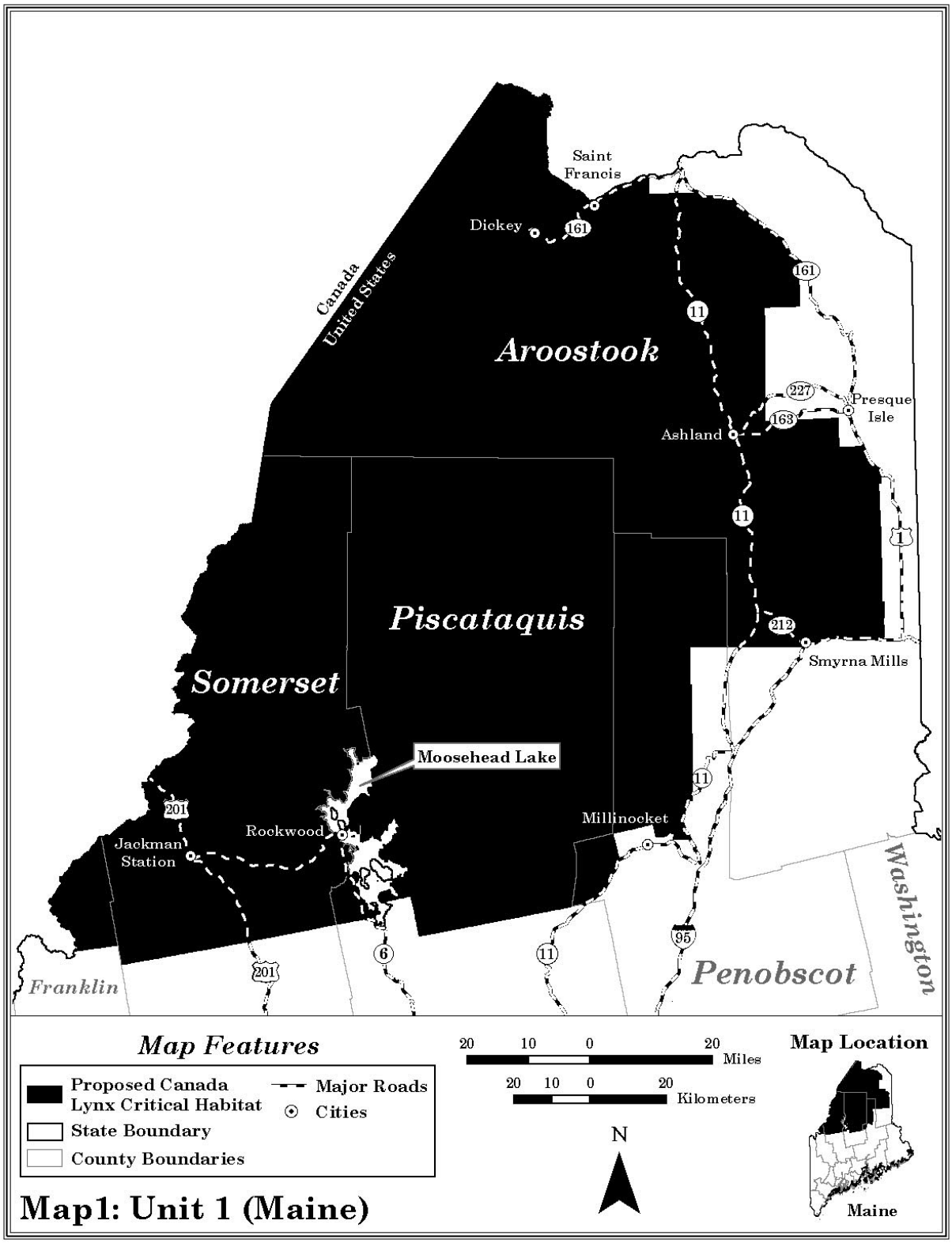

Figure 2. Area that would be designated as lynx critical habitat in Unit 1 under Alternative B.

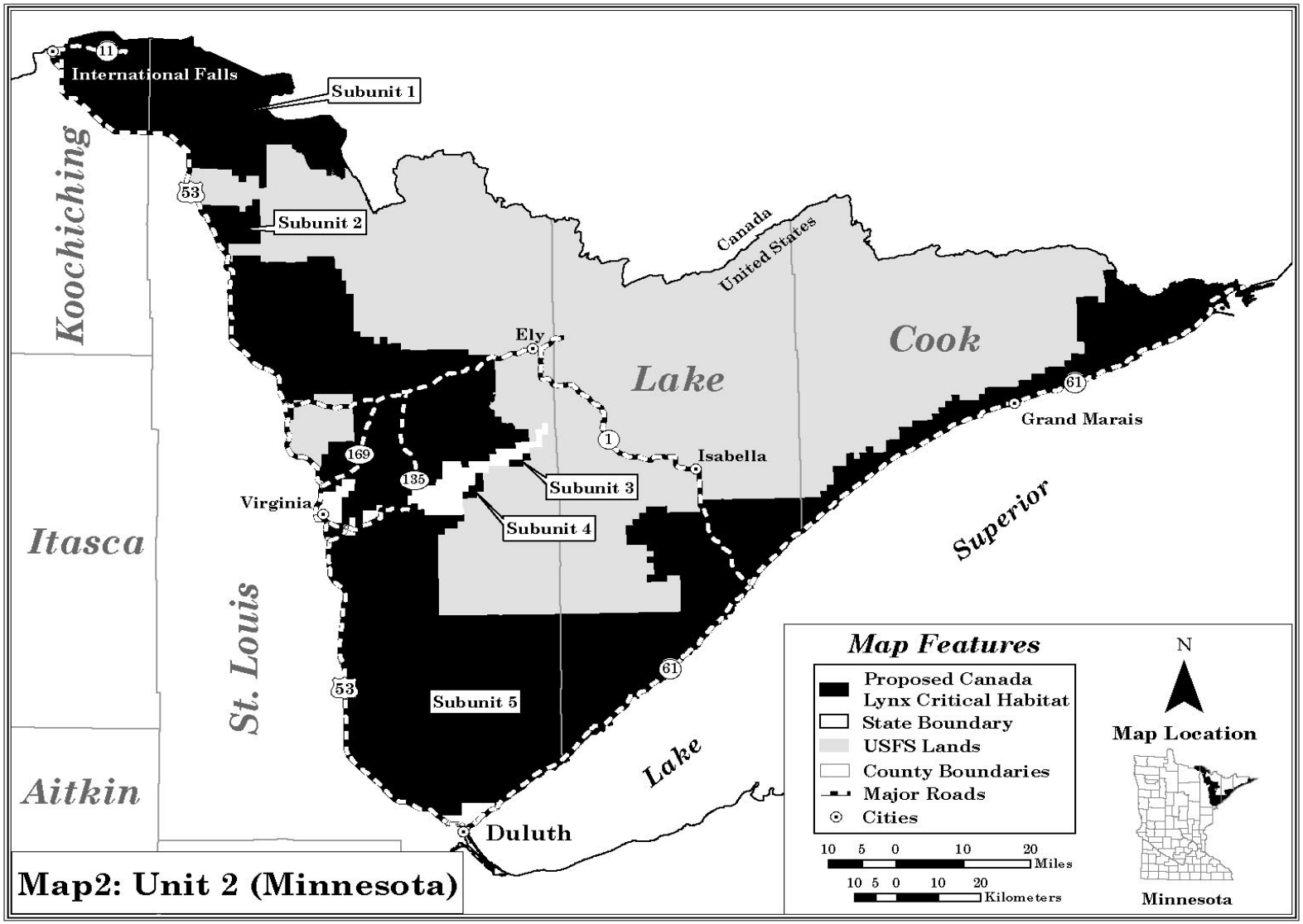

Figure 3. Area that would be designated as lynx critical habitat in Unit 2 under Alternative B.

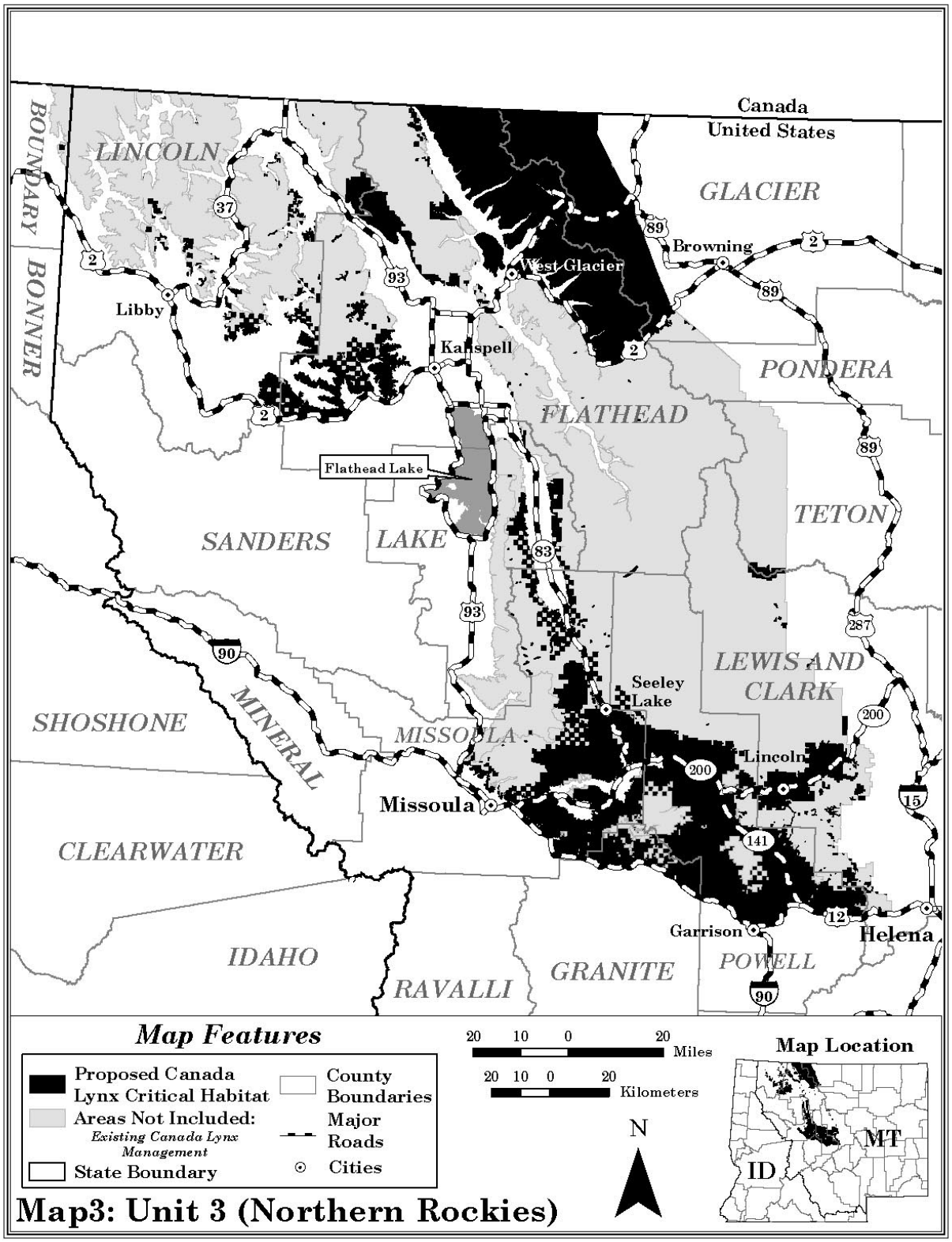

Figure 4. Area that would be designated as lynx critical habitat in Unit 3 under Alternative B.

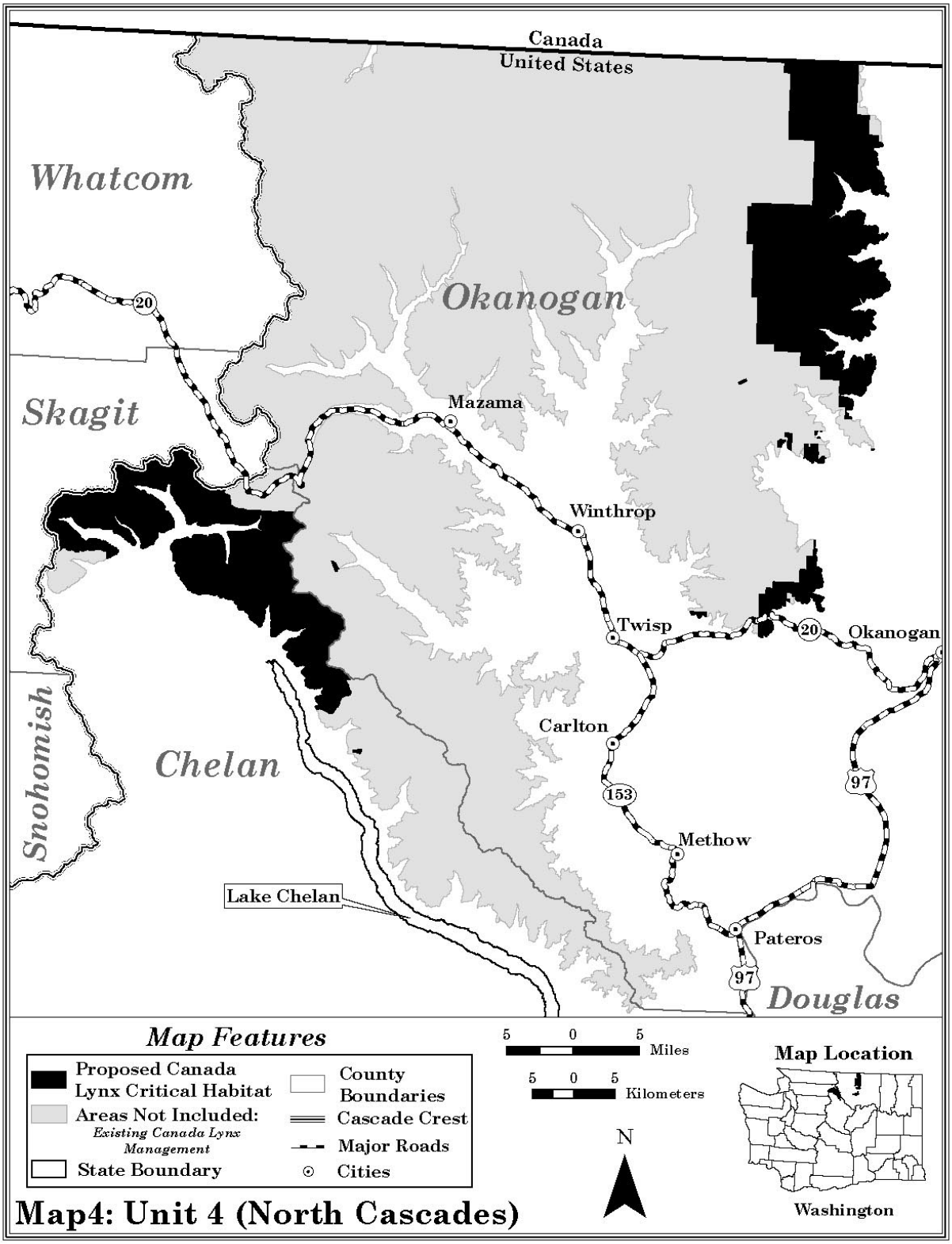

Figure 5. Area that would be designated as lynx critical habitat in Unit 4 under Alternative B.

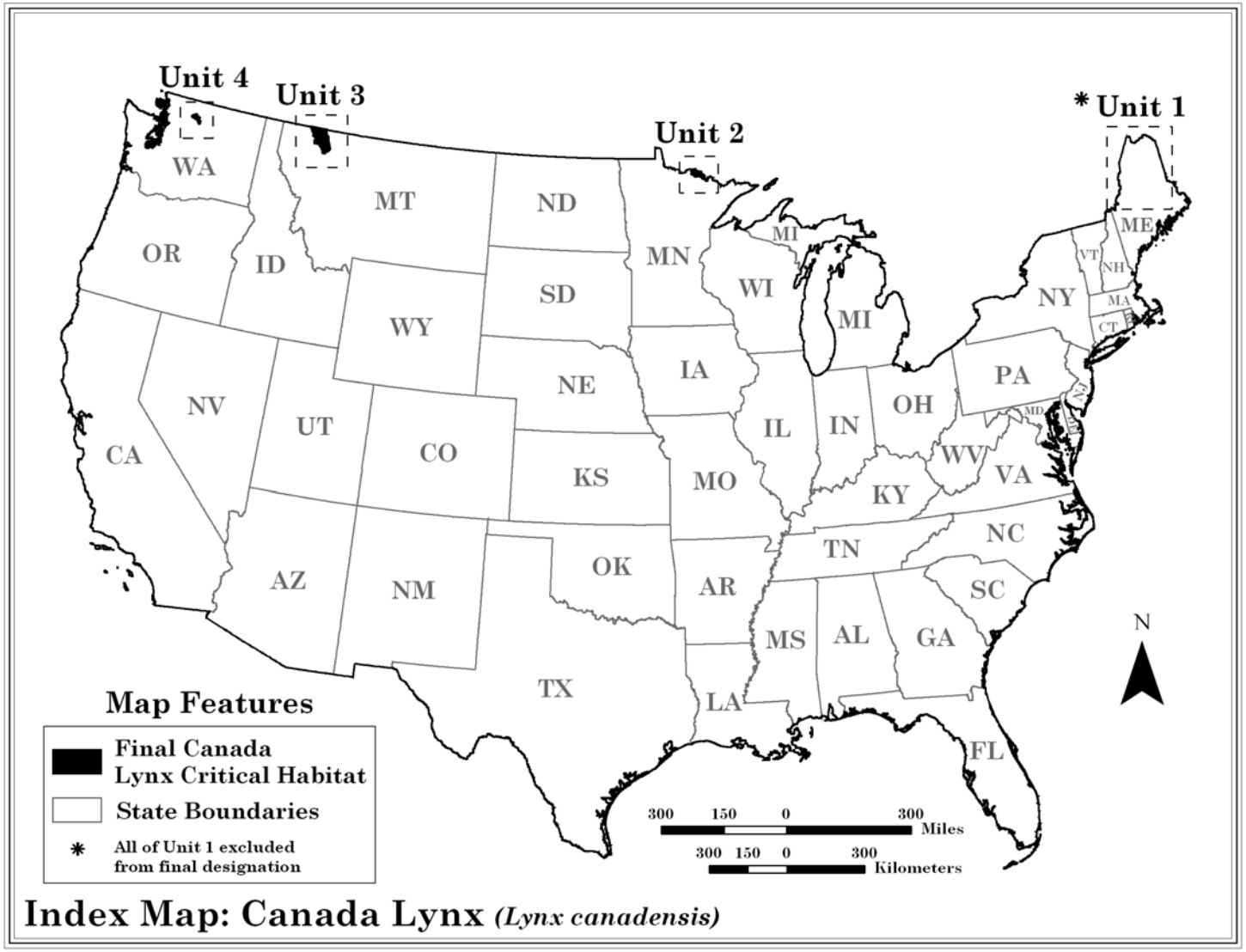

Figure 6. Location of National Park lands designated as lynx critical habitat under Alternative C, the preferred alternative.

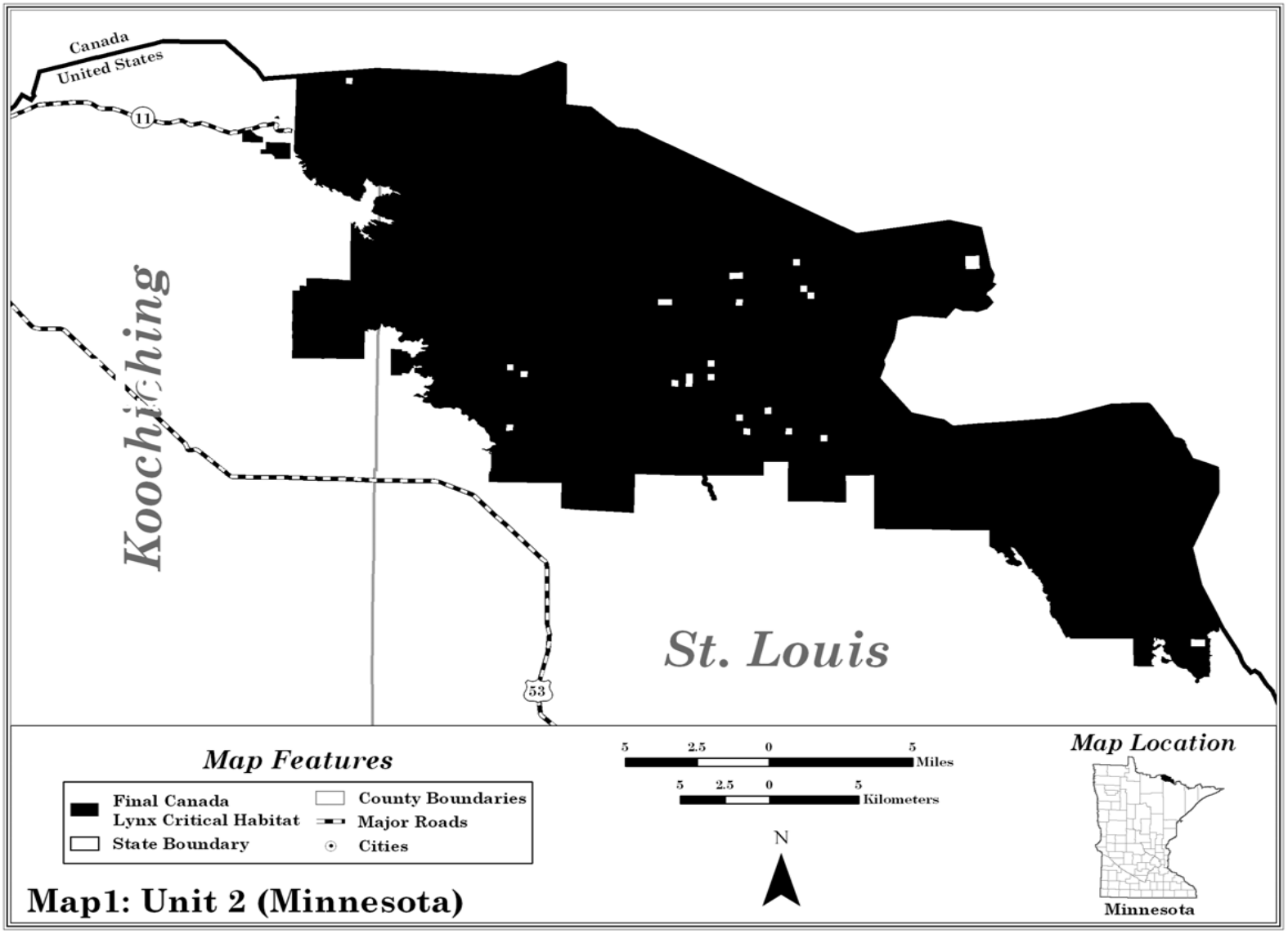

Figure 7. Area of Voyageurs National Park designated as lynx critical habitat under Alternative C, the preferred alternative.

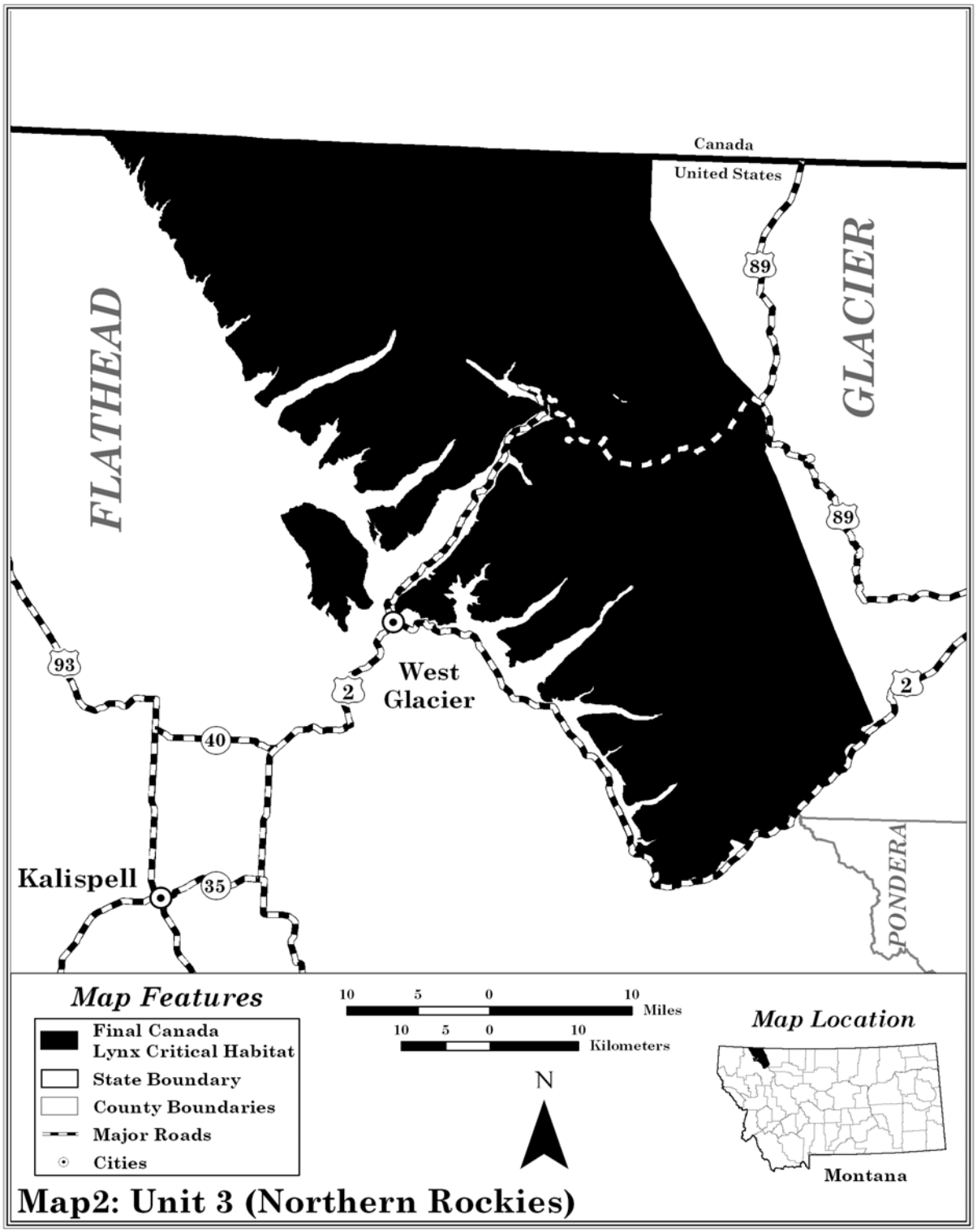

Figure 8. Area of Glacier National Park designated as lynx critical habitat under Alternative C, the preferred alternative.

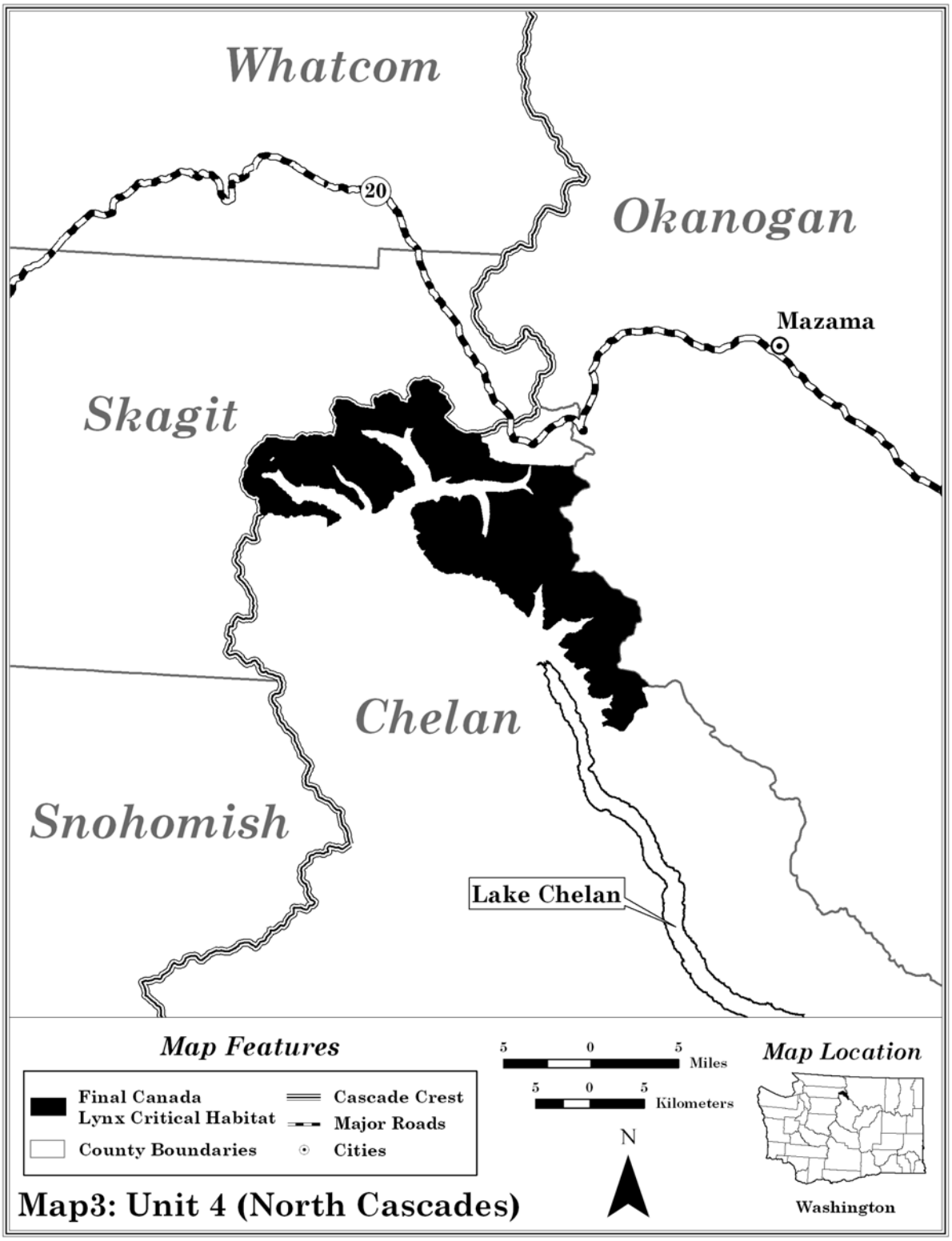

Figure 9. Area of North Cascade National Park designated as lynx critical habitat under Alternative C, the preferred alternative.